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FREITAG (J. H.). **Negative evidence on multiplication of curly-top virus in the Beet leafhopper, Eutettix tenellus.**—*Hilgardia*, x, 9, pp. 305–342, 6 figs., 4 graphs, 1936. [Received April, 1937.]

The author points out that if the virus of sugar beet curly top [*R.A.M.*, xvi, p. 294] multiplies in the leafhopper vector *Eutettix tenellus*, the insects probably should not only retain the infective capacity during their entire adult life, but when fed for only a short period on a diseased beet should be able to cause as many infections as those fed for a longer time. In investigations made to ascertain whether the virus does in fact so multiply, the results obtained showed that there was no evidence to support the view that it does. Many infective leafhoppers lost their ability to produce infection during late adult life, and others, though retaining their infectivity, infected beets only at long intervals. Insects fed only for a short time on a curly-top beet averaged only 3·4 infections when transferred daily to successive healthy beets during adult life; insects fed for long periods averaged 15·6 infections. These results indicate that the leafhoppers are merely internal mechanical carriers.

Insects first infected during the latter part of their adult life did not transmit the disease as frequently as those infected early, but this loss of infectivity was less than that which occurs in infected insects maintained on healthy plants, and some leafhoppers re-infected during later adult life transmitted the virus as readily as recently moulted adults.

Great variation was noted in the length of the period of delay in the development of the infective capacity. The period that elapsed between the initial feeding of 10 minutes to 3 hours and the first infection varied from 1 to 44 days, and averaged 9·6 days. This result likewise affords no evidence of multiplication, as infections would be expected at regular intervals if there was an increase of virus in the insect.

YU (T. F.). **A bacterial stem blight of Broad Bean.**—*Bull. Chin. bot. Soc.*, ii, 1, pp. 32–42, 3 pl., 1936.

In the course of investigations on the broad bean (*Vicia faba*) stem blight (*Botrytis*) [*R.A.M.*, xvi, p. 230] in the Nanking district of China, a weakly pathogenic bacterium was isolated from blackened and decayed material. Inoculation experiments with the organism on wounded stems resulted in the development, after an incubation period

of 8 to 12 hours, of blackish lesions which rapidly extend under moist, warm conditions and may attain a length of 4 to 8 cm. in 24 hours. Ultimately the whole stem softens and rots. The inoculation of injured seeds induced infection in up to 82·1 per cent. of the resultant seedlings, the tips of which in severe cases became blackened and necrotic before the unfolding of the leaves, while the latter, especially the lower ones, were liable to develop an apical or marginal blackening.

The organism, an obligate wound parasite, is named *Phytomonas fabae* n.sp. It is a rod with rounded ends, 1·1 to 2·8 by 0·8 to 1·1 μ, motile by 1 to 4 polar flagella, occurring singly or in pairs, forming capsules but no spores, Gram-negative, non-acid-fast, aerobic; the circular, viscid colonies on nutrient agar are white when young, turning salmon-coloured with age, raised, smooth, zonate, or rugose; a white pellicle is formed on broth, a small amount of indol is produced and nitrate reduced; acid (without gas) is formed only from dextrose among the sugars tested; milk is neither coagulated nor peptonized, litmus and methylene blue in milk are reduced; the minimum, optimum, and maximum temperatures are 4°, 35°, and 37° to 38° C., respectively, and the thermal death point 52° to 53°.

Official Seed Testing Station.—*Rep. nat. Inst. agric. Bot., Camb., 1935–36*, pp. 14–16, [1937].

During the year ended 31st July, 1936, out of 40 samples of celery seed examined at the Official Seed Testing Station, Cambridge, only 3 were free from infection by *Septoria apii* [*R.A.M.*, xv, p. 552] and 6 contained over 60 per cent. of infected seed. Over half the samples were free from infection by *Phoma apiicola* [ibid., xv, p. 768], but 16 samples contained from 1 to 10 per cent. infected seed. *Helminthosporium avenae* [ibid., xvi, p. 20] developed on a number of oats samples and *Ascochyta pisi* [ibid., xvi, p. 298] on a relatively large number of pea samples.

Wood (F. C.). **Studies on 'damping off' of cultivated Mushrooms and its association with Fusarium species.**—*Phytopathology*, xxvii, 1, pp. 85–94, 2 figs., 1937.

Fusarium oxysporum, *F.* [*solani* var.] *martii* [*R.A.M.*, xiv, p. 615], *F. culmorum*, *F. flocciferum* [ibid., xv, p. 716], *F. redolens* [ibid., xiv, pp. 32, 409, 613], and *F. sambucinum* [ibid., xv, p. 765] and its form 6 were consistently detected in the casing soil of cultivated mushroom [*Psalliota* spp.] beds affected by various types of 'damping-off' in the south of England. The two first-named species were the most common, *F. oxysporum* attacking chiefly the brown variety of mushroom and *F. solani* var. *martii* the white. The symptoms induced by both are similar and include a pithy, withered texture, a brown discoloration of the interior of the stipe, a dark, burnished appearance of the pileus, reduction in size, asymmetrical development, and eventual mummification. Positive results were given by soil inoculation experiments with these two species of *Fusarium*, to both of which the brown type of mushroom proved considerably more resistant than the white.

ETORMA (S. B.). **Chemical studies on Cassava products. I. The critical moisture-molding content of Cassava starch.**—*Philipp. J. Agric.*, vii, 4, pp. 409–412, 1 graph, 1936. [Issued 1937.]

The storage of cassava starch for long periods may become a problem with the development of the cassava-starch industry in the Philippines, the high prevailing humidity promoting the saccharification of the starch by moulds. In the experiments described samples inoculated with cultures of the *Aspergillus oryzae-flavus* mould group were placed on Petri dishes and subjected to 11 different treatments, in the open air, over water, over 1N, 2N, 3N, 4N, 5N, 10N, 15N, and saturated sodium hydroxide, and over saturated sodium chloride. Periodic determinations of moisture showed that the rate of moisture absorption or loss was very variable and that the critical moisture-moulding content was 19 per cent., much below which the cassava starch should be dried to keep it free from moulds.

CROSIER (W. F.). **Prevalence and significance of fungous associates of Pea seeds.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1936*, pp. 101–107, 1936. [Received April, 1937.]

Careful examination of 6,500 samples of pea seed since 1932 indicated that only a few disease organisms are important, other fungi found being regarded as probable, but not common, associates of the seed. *Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes* occur annually in several samples of seed examined at Geneva, New York, especially in those from the eastern United States, eastern Canada, and England. Seed stocks produced in the Palouse district of Washington and Idaho are protected climatically from these fungi, and are commonly used throughout the United States. Affected seeds are not readily recognized when dry but generally show a slight to extensive, sunken or flush, firm or spongy, slightly discoloured to light brown lesion. A fine, dense, white mycelial growth develops after 4 to 7 days in germination tests, followed within 10 days by pycnidia.

Detection during germination of the pathogenic species of *Fusarium* associated with pea seeds is easy, owing to the copious, fluffy, white to pink or red fungal growths that develop, a pinkish coloration definitely identifying this genus. During 1935–6 many samples of peas produced in New York were found to contain appreciable percentages of *Fusarium*-affected seeds. Pathogenicity appeared to be weak. Experimental evidence showed that while *Fusarium* spp. and *Botrytis* sp. reduce the germination percentage of peas, they do not inhibit the growth of the emerged plants; *A. pisi* and *Sclerotium* sp. affect neither germination nor growth, and *Rhizoctonia* [*Corticium*] *solani* both reduces germination and markedly inhibits plant development, the emergence of seedlings from inoculated seed varying from 0 to 55 per cent., as against 85 per cent. in the controls. *C. solani* and *Sclerotinia sclerotiorum* were only occasionally found in commercial pea seed stocks.

A common saprophyte associated with pea seed stocks, regardless of their dead seed content, is the seed coat-inhabiting *Dematium* [*Pullularia*] *pullulans* [*R.A.M.*, xiv, p. 2], repeated pathogenicity tests with which on plants of many varieties gave negative results.

MILISAVLIEVIČ (D.). **Sur les causes de dépérissement de la Vigne en Frouchka Gora (Yougoslavie).** [On the causes of the dying-off of the Vine at Frouchka Gora (Jugo-Slavia).]—*Rev. Vitic., Paris,* lxxxvi, 2,220, pp. 25–26, 1937.

This is a reprint of the French summary appended to the author's recent communication on the serious dying-off of the vine at Frouchka Gora, Jugo-Slavia [*R.A.M.*, xvi, p. 229].

BRANAS (J.). **Chronique méridionale hebdomadaire. Le provignage et l'excoriose.** [Weekly note from the south. Layering and excoriosis.]—*Rev. Vitic., Paris,* lxxxvi, 2,222, pp. 77–79, 1937.

The author suggests that perhaps the chief reason why excoriosis [*Phoma flaccida*: *R.A.M.*, xvi, p. 151] of the vine has been and still is steadily gaining ground in southern France, is to be sought in the ever-increasing practice there of using grafted planting-material, since scions, in order to fit the stock, are mostly taken from the basal parts of the current year's main shoots, the buds on which almost invariably contain mycelium of the causal fungus [loc. cit.] in infected areas. He suggests further that the slight nature of the trouble in former years was probably due to the then prevalent practice, in renewing the vineyards, of layering from the old stocks, mostly by laying down and digging in the old stocks at the bottom of one-foot-deep trenches, only the apical parts, devoid of mycelium, of their shoots being used to form the new stocks. If these suggestions are correct, then in areas free from *Phylloxera* the old method might again be tried to keep down the disease, and where grafted stocks cannot be dispensed with, care should be taken to select the scions as much as feasible only from the upper two-thirds of the vine shoots.

SARAZIN (C.). **Traitements d'hiver de la Vigne.** [Dormant treatments of the Vine.]—*Agric. prat., Paris* (formerly *J. agric. prat., Paris,* N.S.), ci, 4, pp. 106–107, 1937.

Vine-prunings cut from the stocks following the harvest must on no account be incorporated with the soil but should be burnt or transferred to the silo to avoid the dissemination of fungal parasites. Painting the pruning wounds with tar or 30 per cent. iron sulphate with the addition of 1 kg. sulphuric acid per hectol. prevents the permeation of the medulla and wood vessels by *Stereum necator* [*R.A.M.*, xv, p. 631], besides ameliorating or curing such physiological disorders as chlorosis [ibid., xvi, p. 366], court-noué [ibid., xvi, p. 18], and non-parasitic apoplexy [ibid., xiv, p. 347].

ASBURY (C. E.), BRATLEY (C. O.), & PENTZER (W. T.). **Further observations on mold control in Grapes during transit and storage. 1935 season.**—*Blue Anchor,* xiii, 6, pp. 8, 9, 21, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvi, 3, p. 352, 1937.]

As in previous years, sulphur dioxide fumigation [against *Botrytis cinerea* and other moulds] exerted beneficial effects on grapes [*R.A.M.*, xv, p. 701, and next abstracts] shipped in crates [from California] to eastern markets for immediate consumption, and when combined with

the addition of sodium bisulphite to the packing-pads increased the duration of commercial life. The use of sodium bisulphite for this purpose, however, is still in the experimental stage, and careful supervision is required to determine the correct amount and proper distribution of the compound in the packing-materials.

Du Plessis (S. J.). **Control of Botrytis rot of Grapes.**—*Fmg S. Afr.*, xii, 130, pp. 36–37, 1937.

The best control of *Botrytis cinerea* [see preceding abstract] in Henab Turki grapes in the dusting experiments carried out at the Stellenbosch-Elsenburg College of Agriculture in 1935–6 was given by 80–20 verderame-sulphur mixtures. Satisfactory results were also given by the fumigation of the grapes with 4 per cent. formaldehyde gas, the Red Hanepoot variety benefiting particularly by this treatment. Another promising method of control consists in the application to the wood-wool box linings of a 6 per cent. formaldehyde solution (10 c.c. per box), or the spraying of corrugated paper linings with the same preparation at a concentration of 4 per cent., especially where the bunches are packed slanting. The rot was also well controlled by soaking ordinary grape-wrappers in a 1 per cent. iodine or 2 per cent. potassium iodide solution. Of the chemicals tested against *B. cinerea*, the most effective was ammonium bicarbonate (10 gm. per box), but further experiments are necessary before definite recommendations for this form of treatment can be made.

The fungus was found to develop extensively during cold storage at 34° F., and to grow rapidly thereafter at room temperatures.

In the vineyard the organism developed profusely after rain on dried cuttings and leaves on the ground, emphasizing the necessity for the destruction of all such material before the commencement of picking. The inclusion in packs of infected bunches not only leads to heavy infestation of the sheds but also involves severe wastage in storage by *B. cinerea* and to a lesser extent by *Penicillium*.

Dreyer (D. J.). **The effect of handling practices at Southampton and Nine Elms on the keeping quality of South African Grapes with a description of the discharge, handling and delivery of South African fruit from Southampton to Covent Garden.**—*Bull. Dep. Agric. S. Afr.* 161, 46 pp., 36 figs., 1 graph, 1936.

Boxes of South African White Muscat and Raisin Blanc grapes handled by ordinary methods prior to loading by rail were found to contain a higher percentage of 'wasty' and short-lived fruit due to infection by *Botrytis* [*cinerea*], *Penicillium* [see preceding abstracts], or other damage than those carefully handled and loaded to rail by means of the 'skid' (raised platforms or sledges) method. It was further shown that the extra handling necessitated by the off-loading of the boxes at Nine Elms (Southern Railway's London depot) and their transference to ordinary road vehicles leads to increased wastage and curtails the life of the fruit in comparison with that delivered direct in the original rail truck (road/rail container). Boxes receiving ordinary handling and delivered by road vehicle contain, 10 days after discharge,

1·5 per cent. more mouldy berries and 5·3 per cent. more total unsound fruit than those handled by the skid method and delivered direct by road/rail containers.

Some technical recommendations are made for improving the ordinary handling and delivery methods on the lines indicated without unduly retarding the work of dispatch from the Southampton docks.

Kort Verslag van het Rijksproefstation voor zaadcontrôle te Wageningen (tijdvak 1 Juni 1935—1 Juni 1936). [A brief report of the State Experiment Station for Seed Testing at Wageningen (period from 1st June, 1935, to 1st June, 1936).]—20 pp., 1936. [Received April, 1937.]

The following are among the items of phytopathological interest in this report of the Dutch Seed Testing Station. Only 4 per cent. of the total number of pea samples examined showed more than 10 per cent. infection by *Ascochyta pisi* [*R.A.M.*, xv, p. 74 *et passim*], from which Mansholt's hybrid extra-green short was practically free.

Phoma [*betae*] was frequently present in amounts exceeding 90 per cent. in the beet seed samples submitted for testing. The beneficial effects of seed disinfection were convincingly demonstrated in an experiment with sugar beets [ibid., xv, p. 190 *et passim*].

Alternaria radicina [ibid., xv, p. 768] was detected in numerous carrot samples; in two out of three lots of seed treated with ceresan dust, germination was increased by 37 to 49 and 59 to 71 per cent., respectively.

Over 31 per cent. of the black salsify [*Scorzonera hispanica*] samples examined showed mild infection by *Sclerotinia* [? *sclerotiorum*: ibid., xi, p. 767].

Ten out of eleven cabbage samples were more or less severely attacked by *P.* [*lingam*: ibid., x, p. 327], good control of which is stated to have been obtained by one hour's immersion in 0·25 per cent. ceresan solution.

Of the 525 wheat samples examined for the presence of bunt [*Tilletia caries* and *T. foetens*], 31 per cent. were entirely free from the disease, 34 per cent. showed less than 10 spores per drop [of test suspension], 31 per cent. more than 10 but less than 100 spores per drop, and in 4 per cent. the latter figure was exceeded.

Oats were in general nearly free from *Helminthosporium avenae* [ibid., xv, p. 73 *et passim*], but the Black President and Star varieties showed about 10 and 6 per cent. infection, respectively.

Division of Botany.—*Rep. N.Y. St. agric. Exp. Sta., 1935–36*, pp. 28–35, 1936. [Received March, 1937.]

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xv, p. 282], contains, *inter alia*, the following items of phytopathological interest. In field trials with sulphur fungicides against apple scab (*Venturia inaequalis*) summer oil materially increased adhesiveness, but, although not used after July 1st, gave a very objectionable residue. Catalytic sulphur almost eliminated foliage injury due to lime-sulphur, even when used in poor drying conditions or with calcium arsenate. Bordeaux mixture substitutes gave commercial control at low concentrations, but with too much injury. There is an urgent

need for a new fungicide for use against *V. inaequalis*, and it would appear that it must come from outside the sulphur and copper groups.

Experiments conducted since May, 1935, appeared to demonstrate the value of roguing in drastically reducing, though not entirely eliminating, 'mosaic' strawberry plants from affected stocks [loc. cit.]. In mixed experimental plantings of healthy and 'mosaic' plants no spread took place except by runner propagation.

Root rot of peas [? *Aphanomyces euteiches* and *Fusarium solani* var. *martii* f. 2: ibid., xiv, p. 151; xv, p. 339] is becoming increasingly serious, the causal organisms accumulating in the soil with each crop of peas. Rotation delays the onset of failure in point of time, but not as regards the number of crops. Failure occurs after about four crops.

Several mosaic-immune lines of Stringless Green Refugee beans [*Phaseolus vulgaris*: ibid., xvi, p. 11] were released for propagation.

Further tests showed that red [cuprous] copper oxide [ibid., xv, p. 282] give definitely promising results on lime-sensitive plants such as cucurbits, tomatoes, hops, and roses, any tendency to injury being largely corrected by amendment with cotton seed-oil emulsion.

Hop downy mildew [*Pseudoperonospora humuli*] was controlled by Bordeaux mixture, zinc oxide, and cuprous oxide, the last-named being selected by most growers because the least injurious, and in one garden increasing the yield by over 80 per cent.

In the section of this report dealing with seed investigations (p. 86) it is stated that *Rhizoctonia* [*Corticium*] *solani* is infrequently associated with pea seed [see above, p. 435]. Several isolations were extremely pathogenic, completely destroying the laboratory tests and reducing the soil germination of new crop seed stocks by 75 to 90 per cent.

Botany and plant pathology section.—*Rep. Ia agric. Exp Sta., 1935–36*, pp. 97–113, 1936. [Received May, 1937].

Crosses of the non-commercial African watermelon varieties, Africa 8, 9, and 13, which are resistant to anthracnose (*Colletotrichum lagenarium*) [*R.A.M.*, xv, p. 698; xvi, p. 228] but susceptible to wilt [*Fusarium bulbigenum* var. *niveum*: ibid., xvi, p. 85], with [the wilt-resistant] Iowa Belle, Iowa King, and others were made by D. V. Layton. Resistance to anthracnose was dominant to susceptibility, and segregation in F_2 and F_1 from the back-cross demonstrated the presence of only a single factor pair for resistance and susceptibility. From these crosses strains resistant to both diseases were developed.

H. C. Murphy found 14 physiologic forms of oat crown rust [*Puccinia lolii*: ibid., xvi, p. 245 and below, p. 446] at 20 nurseries in different states. Forms 7 and 1 were most prevalent and two new ones were designated 40 and 41. The latter, together with forms 33 and 34, occurred only in the southern States. In 1935, the disease caused an estimated reduction of 20 per cent. in the total yield for Iowa. Selections from the crosses Victoria × Richland, Bond × Iogold, Bond × C.I. 2344, Markton × Rainbow, and Iowa 444 × Markton, showed outstanding resistance to *P. lolii*, stem rust [*P. graminis*], and smut [*Ustilago avenae* and *U. kolleri*]. The new variety Mutica Ukraina, C.I. 3259, was markedly resistant to crown rust, and in greenhouse tests was almost immune from forms 34, 35 (which attack Bond), and 41. The new South

African varieties S.E.S. 49, 42, and 52, and C.I. 3032, 3033, and 3034, were resistant to both rusts in the field, but susceptible to smut.

In 1936, W. J. Henderson and C. M. Nagel found that owing to cloudy, humid periods, during which sugar beet foliage bore a film of water continuously, penetration by the leaf spot fungus [*Cercospora beticola*: ibid., xv, p. 486] proceeded uninterruptedly even in the wider spacings, all the plants showing uniform infection.

In three seasons J. J. Wilson secured control of sweet potato-stem rot [*Fusarium bulbigenum* var. *batatas* and *F. oxysporum* f. 2: ibid., xiv, p. 150] by dipping the slips after pulling and before setting out in semesan solution (1 oz. per 3½ galls. water).

Studies by I. E. Melhus and W. J. Henderson showed that *Phoma terrestris* [ibid., xv, p. 486] attacks onion roots at any stage of development of the onion, but does not rot the tissues of the bulb. *Fusarium* [*vasinfectum* var.] *zonatum* f. 1 [ibid., xiv, p. 150] alone attacked onions only when these were artificially wounded, but in combined inoculations with *P. terrestris* it became a virulent secondary invader, causing a semi-dry rot.

Investigations by C. S. Reddy into the causes of flax failures indicated that the seed-rotting and seedling blight organisms are principally soil-borne Pythiaceous fungi. Seed treatment was effective, however, since flax becomes resistant soon after germination. In 1935, nine varieties of flax seed treated with new improved ceresan (½ oz. per bushel) gave 112 and 30 per cent. more plants on heavily and lightly infected land, respectively, than the untreated controls of the same varieties.

Of nine [tabulated] barley varieties tested by C. S. Reddy and H. D. Hughes the most resistant to scab [*Gibberella saubinetii*: ibid., xv, p. 487] were Peatland, Manchuria, and Spartan, with 10, 32, and 43 per cent. infection respectively, taking the amount present on the most susceptible variety (Glabron) as equivalent to 100 per cent. G. N. Davis and R. H. Porter found that *G. saubinetii* on barley seed can be as well controlled by the autotoxin as by ethyl mercury phosphate, at present the most effective dust treatment. The best results were given when 8 gm. of mass culture of the fungus were extracted with 100 c.c. of distilled water, and the seed soaked in the filtrate for 24 hours, later being kept at 10° C. until germinated.

Fifty-fourth Annual Report of the Ohio Agricultural Experiment Station 1934–1935.—*Bull. Ohio agric. Exp. Sta.* 561, 133 pp., 9 figs., 3 graphs, 1 map, 1936. [Received April, 1937.]

During the period under review very satisfactory control of scab [*Venturia inaequalis*] on Cortland, McIntosh, and Stayman apple trees was obtained in comparative spraying tests carried out by H. C. Young in Ohio with wettable sulphurs, used mostly at half-strength supplemented with lime-sulphur (half-strength) at pre-bloom and petal-fall, the best control ranging from 2·1 to 2·5 per cent. scab, as against 4·7 per cent. with lime-sulphur alone and 100 per cent. in the untreated controls.

In a study made by H. C. Young of apple tree measles [*R.A.M.*, xiv, p. 372] negative results followed attempts to transmit the disease by means of fungi, bacteria, sap, or bud grafts from diseased trees, and it

is concluded that it is probably due to some soil deficiency. This view is supported by the fact that many badly diseased trees recovered in the 1934–5 season, when good growing conditions prevailed. Further investigations are in progress.

In a comparative spraying test the best control of bitter rot [*Glomerella cingulata*: ibid., xv, p. 555; xvi, p. 368] on Rome Beauty and Ben Davis apples was given by Bordeaux mixture 2–3–50, followed in order by basic copper chloride, cuprous oxide, and basic copper sulphate, the apples treated with the last-named being little cleaner than the controls.

The formaldehyde content of dusts prepared with sawdust, kaolin and infusorial earth mixture, infusorial earth, formofume (a proprietary dust), marl, muck, gypsum, charcoal, and trioxymethylene with infusorial earth declined after six months' keeping from approximately 6 per cent. to 5·67, 5·56, 5·56, 5·5, 4·76, 4·5, 2·52, 1·02, and 5·85 per cent., respectively.

Of 80 bean [*Phaseolus vulgaris*] varieties in four different parts of northern Ohio the most resistant to bacterial blights [*Bacterium medicaginis* var. *phaseolicola*, *Bact. phaseoli*, and other spp.: ibid., xvi, p. 302] were Burpee White Wax, Dwarf Horticultural, French Horticultural, Henderson's New Stringless, Keeney's Stringless Refugee, Low's Champion, Refugee (1000–1) and Tennessee.

R. C. Thomas made some 200 isolations of the bacteriophage to *Aplanobacter stewarti* [ibid., xiv, p. 503]. In general these fell into two groups, a monovalent group effective against one or other of two strains of the organism [ibid., xii, p. 364], and a polyvalent group active against both strains. When a polyvalent phage was kept in association with one strain of *A. stewarti* the titre for that strain was increased and for the other correspondingly decreased.

Edson (H. A.) & Wood (Jessie I.). **Diseases of plants in the United States in 1935.**—*Plant Dis. Reptr, Suppl.* 96, 289 pp., 12 graphs, 8 maps, 1936. [Mimeographed. Received May, 1937.]

This report, prepared on the usual lines [*R.A.M.*, xv, p. 427], contains valuable information on the incidence and distribution, in relation to meteorological and environmental factors, of the diseases affecting cereal, forage and cover, fruit, nut, vegetable, special, and sugar crops, trees, and ornamental and miscellaneous plants in the United States in 1935.

Nagy (R.), Peterson (W. H.), & Riker (A. J.). **Comparison of enzymes in crown-gall and non-inoculated plant tissue.**—Abs. in *Phytopathology*, xxvii, 2, p. 136, 1937.

Quantitative determinations of oxidase, peroxidase, and catalase yielded 130, 120, and 160 per cent. greater enzymatic activity, respectively, in the fresh crown gall [*Bacterium tumefaciens*] than in the contiguous non-inoculated tomato tissue [*R.A.M.*, xii, p. 148]. Fifty c.c. of expressed crown gall juice destroyed in ten hours half the tyrosin in 200 c.c. of a 0·05 per cent. solution, while no loss was detected from a similar preparation of non-inoculated tomato stem tissue.

BROWN (NELLIE A.) & WEISS (F.). **Crown gall of the fasciated type on Asparagus sprengeri.**—*Plant Dis. Reptr*, xxi, 2, pp. 31–32, 1937. [Mimeographed.]

Although the writers' attempts at the isolation of *Bacterium tumefaciens* from fasciated galls on two specimens of *Asparagus sprengeri* [*R.A.M.*, xvi, p. 321] from Oregon and Florida were unsuccessful, the neoplasms on the crown at or just above ground-level, were believed to be of the crown gall type, and this view was substantiated by the inoculation of germinating seeds and seedlings of *A. sprengeri* with the dahlia strain of *Bact. tumefaciens* [ibid., xvi, p. 302], which induced the production of a mass of fleshy, stem-like excrescences. Similar tests with the hop strain gave negative results. The crown gall organism was reisolated from the outgrowths and inoculated into *Ricinus* [*communis*], Paris daisy [*Chrysanthemum frutescens*], and garden balsam [*Impatiens balsamina*], which developed characteristic stem galls. As a general rule asparagus, in common with other monocotyledons, is immune from crown gall, but *Bact. tumefaciens* is evidently capable, as shown by the present exceptional instance, of inducing fasciation in very young shoot tissues of this group of plants.

PRETI (G.). **Iperplasia e tumori radicali della Margherita ('Chrysanthemum frutescens, Thunb.').** [Hyperplasia and root tumours of the Paris Daisy (*Chrysanthemum frutescens* Thunb.).]—*Ital. agric.*, lxxiv, 2, pp. 123–126, 4 figs., 1937.

Bacterium tumefaciens was isolated from tumours on the collar and roots of a crop of Paris daisy (*Chrysanthemum frutescens* Thunb.) [see preceding abstract] cultivated for industrial purposes at Bordighera, and inoculated into healthy plants with positive results. Control measures should include the avoidance of wounds, especially in the root system and collar, careful transplanting, and the application to the soil at the base of affected plants of a mixture of mineral superphosphates and iron sulphate. Severely diseased individuals should be eradicated and burnt, and a reasonable period allowed to elapse before replanting the crop on infested soil. Organic manures should not be applied.

DILLON WESTON (W. A. R.), HANLEY (F.), & BOOER (J. R.). **Seed disinfection. II. Large-scale field trials of the disinfection of seed corn with mercury dust disinfectants.**—*J. agric. Sci.*, xxvii, 1, pp. 43–52, 1937.

A further account [*R.A.M.*, xv, p. 667] is given of field experiments in 1934–5 in four English counties, the tabulated results of which showed that treatment of the seed-grain of wheat, barley, and winter and spring oats with a proprietary mercury dust or with one of two experimental dusts (A and B) containing organic mercury compounds, had no harmful effect on the germination of the seed, when the dust was applied just before sowing, and in the case of spring oats when the seed was sown $7\frac{1}{2}$ weeks after treatment. The dust A was prepared by mixing 100 lb. of filler (non-adsorbent aluminosilicate with an average particle diameter of 9 μ) with an aqueous solution of 0·55 lb. mercuric chloride (equivalent to 0·4 lb. Hg), and then adding to the dried mixture

1·375 lb. of methyl mercury iodide (equivalent to 0·8 lb. Hg); the dust B consists of 100 lb. of the same filler intimately mixed with an aqueous solution of 1·11 lb. of methyl mercury nitrate (equivalent to 0·8 lb. Hg). Both the proprietary and the two experimental dusts were effective in controlling wheat bunt [*Tilletia caries*]; in one series of tests, in which artificially bunted seed was used, the percentage of bunt in the ensuing crop was reduced from 11·8 in the control to 0·4 by the proprietary dust and to 0 by dust A. They were also effective against leaf stripe (*Helminthosporium gramineum*) and net blotch (*H. teres*) of barley, the percentage of which was reduced from 5·0 in the control to 1·0 by the proprietary dust and to 0·6 by dust B, the standard error being 0·2 per cent. The three dusts also increased the speed of 'brairding' [sprouting] of barley, but not the final population; the yield was not increased by the stimulation of seedling growth. In winter oats dust A alone gave a significant increase in plant population and reduced loose smut (*Ustilago avenae*) from 34·5 per cent. in the control to 0·03 per cent., the use of the proprietary dust resulting in 15·9 per cent. infection. In spring oats, on the other hand, the proprietary dust and experimental dust B significantly increased the plant population, and in the series of tests in which spring oat seed-grain, naturally contaminated with *H. avenae* was used, the percentage of infected seedlings was reduced from 22·0 in the control to 0·5 by the proprietary dust and to 0·2 by dust B.

The investigations indicate that discrimination should be used in selecting a disinfectant dust containing organic mercury compounds, since all seed-borne diseases cannot be controlled by the same preparation. Attention is also called to the poisonous and vesicant properties of the two experimental dusts, which require that efficient precautions should be taken when working with them.

Porter (R. H.). **Relation of seed disinfectants to seed analysis.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1936*, pp. 93–101, 5 figs., 1936. [Received April, 1937.]

The commercial development of disinfectants for the control of cereal and other crop diseases not only affords seed analysts an opportunity to prescribe control measures, but also makes it possible in many instances to determine in the laboratory the probable value of seed disinfection. The condition of farmers' stocks of maize seed and the results of treating it [against *Diplodia zeae* and other fungi] have received comparatively little attention, and a study of such stocks have been made at the Iowa State College Seed Laboratory since 1929. In 1933 out of 40 samples of treated seed 92·7 per cent. gave strong germination, 4·7 per cent. weak germination, while 0·6 per cent. were diseased, the corresponding figures for 40 samples of untreated seed being 90·3, 6·7, and 3·5 per cent., respectively. In 1935 out of 471 samples of treated seed 89·6 per cent. showed strong germination, 3·4 per cent. weak germination, and 18 per cent. were diseased, the corresponding figures for an equal number of samples of untreated seed being 83·9, 5·8, and 65·7 per cent., respectively. The yield per acre of disinfected seed was 40·3 bush. against 39·9 bush. for the untreated in 1933 and 60·4 and 57·5 bush., respectively, for 40 samples tested in 1934.

The effect of ethyl mercury phosphate on the laboratory and field

germination of farmers' samples of barley seed infected with *Gibberella saubinetii*, *Fusarium* spp., and *Helminthosporium sativum* was determined, a close correlation being found between the laboratory and field germination of both the treated and untreated lots. Similar results were obtained with wheat. Thus of 5 samples each of treated and untreated wheat seed the former gave 83·8 and 2·5 per cent. strong and weak germination, respectively, with 0·1 per cent. seedling blight, the corresponding figures for the untreated seed being 71·5, 5·4, and 6 per cent., with 11·8 per cent. scab. Treated oats seed gave 86·7 and 5·1 per cent. strong and weak germination, respectively, as against 82·4 and 7·5 per cent. for untreated oats seed, with 5 per cent. scab; treated flax seed gave 65·7 and 5·7 per cent. strong and weak germination, while the figures for the untreated seed were 61 and 6 per cent. None of the copper, zinc, or formaldehyde dusts tested gave effective control of these fungi, but new improved ceresan ($\frac{1}{2}$ oz. per bush.) was a satisfactory disinfectant for wheat, oats, barley, flax, and sorghum. Merko, Garbak III, and new improved semesan jr. are recommended for the treatment of maize. The average field germination of five barley varieties was increased from 58·8 per cent. in the untreated controls to 76·4 per cent. in the case of seed treated with ethyl mercury phosphate diluted to 1 per cent. with talc. For laboratory use, a dilution of 1 part new improved ceresan in 4 parts of talc is recommended, the seed to be treated being placed in a cylindrical bottle with the dust and rotated on two horizontal rollers, one of which is turned by an electric motor.

The conditions which cause mercury poisoning [*R.A.M.*, xvi, p. 377] in plants are unknown, but samples that show it in the laboratory do not always display it in the field. Mercury-treated oats, barley, and wheat seed as well as untreated seed showed no decline in germinative ability after two years' storage, and no serious mercury poisoning in the case of the treated seed except when exhibited at the start.

Verhoeven (W. B. L.). **Zaaizaadontsmetting.** [Seed disinfection.]—*Tijdschr. PlZiekt.*, xlii, 10, pp. 255–274, 2 graphs, 1936.

A general account is given of the current methods of seed disinfection in Holland, with special reference to the combined hot water and chemical (e.g., germisan or ceresan) treatment of wheat seed-grain against loose smut [*Ustilago tritici*: *R.A.M.*, xvi, p. 241], in which connexion the relations between the water absorption by the seed at different temperatures during pre-soaking and immersion and the efficacy of the method are discussed [ibid., xv, p. 787]. The author states that seed-grain is generally placed too densely in the sacks, with the result that the grain in the middle of the sack does not absorb sufficient water. Before removing the grain from the pre-soak bath, the temperature of the water should be raised for a few minutes to 25° C. to prevent too great cooling of the grain during transference to the hot water steep. In practice the growers are inclined to regard seed disinfection as too onerous for regular routine, but the writer considers that all seeds known to carry diseases amenable to treatment should be regularly disinfected. A number of examples of such seed-borne diseases are cited. In conclusion, the growth of the co-operative movement in seed disinfection in Germany [ibid., xvi, p. 24] is reviewed.

Varada Rajan (B. S.). **The problem of rust of Wheat in India.**—*Poona agric. Coll. Mag.*, xxviii, 3, pp. 107–117, 1936.

A semi-popular account is given of the history, economic importance, and life-history of the yellow, brown, and black rusts of wheat (*Puccinia glumarum*, *P. triticina*, and *P. graminis*), with special reference to their occurrence in India and to the possibilities of their control by means of breeding [*R.A.M.*, xiv, p. 567].

Palmiter (D. H.) & Keitt (G. W.). **Studies of copper-lime arsenite dusts for control of Wheat bunt.**—Abs. in *Phytopathology*, xxvii, 2, p. 138, 1937.

Copper-lime arsenite dust mixtures were tested in five series of greenhouse trials in comparison with commercial copper carbonate and ethyl mercury phosphate dusts [*R.A.M.*, xiv, p. 381]. When wheat seed-grain infected by bunt [*Tilletia foetens*] was treated and planted in clean soil, all the dusts used gave practically complete control. When clean or diseased seed was planted in infested soil, certain copper-lime arsenite dusts consistently gave slightly better control than the commercial materials, and increased germination more than copper carbonate but less than the mercurial dust. Small-scale field experiments at Madison, Wisconsin, confirmed the greenhouse results and indicate that copper-lime arsenite preparations possess a relatively high fungicidal value under local conditions.

Welsh (J. N.). **The synthetic production of Oat varieties resistant to race 6 and certain other physiologic races of Oat stem rust.**—*Canad. J. Res.*, xv, 2, pp. 58–69, 5 figs., 1937.

In an attempt to combine in a single oat variety resistance to as many physiologic races of *Puccinia graminis avenae* [*R.A.M.*, xiv, p. 434, and next abstract] as possible, a cross was made between Hajira Strain (resistant to races 1, 2, 3, 5, and 7, semi-resistant to 9 and susceptible to 4, 6, 8, and 10) and Joanette Strain (resistant to 1, 3, 4, and 10, susceptible to 2, 6, 7, 8, and 9 and with an indeterminate reaction to race 5). Of 93 pure lines so obtained 71 were resistant at the seedling stage under greenhouse conditions at 60° F. to race 6, to which no commercial variety is resistant. At 65° to 70° about one-third of the 71 lines were resistant, one-third semi-resistant, and one-third susceptible to this race. At the fifth leaf, boot, and heading stages representative lines from each of these classes were resistant to race 6 at 60°. At 65° to 70°, the reactions differed at the different stages; at the fifth leaf stage only the tip of the top leaf was susceptible, at the boot stage pustules were present on the top node and internode, but the remaining parts were unaffected, while at heading the leaves and culms were resistant but one or two pustules were found on the topmost node or internode. Six lines consistently resistant to race 6 at 60° and 65° to 70°, were resistant in the seedling stage to all ten races except race 9 which was not studied at the same temperatures, while at 75° to 80° they were susceptible to race 6, indeterminate to races 1, 4, and 5, and resistant to the others. Under field conditions, six lines classed as resistant at 65° to 70°, five as semi-resistant, and four as susceptible, when tested

to race 6 all showed infections of a semi-resistant type on the uppermost internodes, the other parts being unaffected. Resistance in the hybrids to races 6 and 8 was probably obtained through transgressive segregation as neither parent is resistant to these races.

The standard varieties, Hajira Strain, Joanette Strain, White Russian, and Victory oats, used as controls, were susceptible to race 6 in all the greenhouse tests and also, except White Russian (which was semi-resistant), in the field test.

Humphrey (H. B.) & Coffman (F. A.). **A study of the reaction of F_1 Oat hybrids and their respective parental lines to inoculation with rusts and smuts.**—*Phytopathology*, xxvii, 2, pp. 183–189, 1937.

Experimental data are tabulated and discussed showing that none of the 28 F_1 progeny resulting from hybridization between widely different oat types gave any indication of susceptibility to smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) [*R.A.M.*, xv, p. 642; xvi, p. 309, and next abstracts], even in the nine out of 17 crosses in which one or other parent was susceptible. Likewise, none of the F_1 plants arising from the nine crosses made in 1935–6 was susceptible, although one or other of the parents became diseased in two of the nine. It is possible that the dehulling of the parent seed but not of the F_1 seed may have increased infection in the former, but the dominance of resistance over susceptibility to *U. avenae* and *U. kolleri* in the F_1 is believed to have been shown by these results.

The data obtained in a two-year study of the reaction of the offspring of 26 oat crosses to *Puccinia graminis avenae* race 2 [see preceding abstract] indicate that resistance is usually, but not invariably, dominant, while similar but less clear-cut results were secured in connexion with *P. coronata avenae* [*P. lolii*] race 1. It was observed in the rust studies that the F_1 plants of certain crosses tended to follow the type of resistance manifested by the more resistant of the parents.

Reed (G. M.). **Report on the influence of the growth of the host on smut development.**—*Misc. Amer. Philos. Soc.*, i, 2, pp. 43–46, 1936.

Danish Island, Monarch, Scottish Chief, and Gothland oats were grown with and without sodium nitrate and with and without evening illumination from 8th February to 28th March and inoculated with three strains of covered and three of loose smut (*Ustilago levis* [*U. kolleri*] and *U. avenae*) [see preceding abstract]. The illuminated pots without nitrate made the most rapid growth, heading in about ten weeks, followed by the illuminated series with nitrate. The highly susceptible Monarch and Gothland varieties showed 100 per cent. infection in all the series, Danish Island 35, 44·4, 35, and 35 per cent. in the illuminated without nitrate, illuminated with nitrate, non-illuminated without nitrate, and non-illuminated with nitrate series, respectively, while the corresponding figures for Scottish Chief were 80, 65, 61·1, and 60, respectively.

In further experiments to determine the influence of soil moisture and temperature on the incidence of smut infection on oats in sand cultures, it was shown that almost invariably the heaviest amounts of disease are secured at about 20° C. with a low soil moisture content.

The course of development of the smuts, after entrance during the germination period of the host, does not appear to be substantially modified by differences in the rate or extent of the growth of the plants.

PICHLER (F.). **Über die Anfälligkeit verschiedener Hafersorten für Flugbrand.** [On the susceptibility of different Oat varieties to loose smut.]—*Neuheiten PflSch.*, xxx, 1, pp. 1–3, 1937.

Using a modification of Zade's method [*R.A.M.*, xii, p. 431], the writer inoculated twelve varieties of oats commonly cultivated in Austria with *Ustilago avenae* [see preceding abstracts], the resultant degrees of infection ranging from 0·3 per cent. in the highly resistant Tschermak's Yellow to 41·1 per cent. in the very susceptible Fichtelgebirg. Other resistant varieties included Waldsack's and Lochow's Yellow (0·7 and 2·4, respectively), while Duppau, Hirschbach, Schlägler, and Loosdorf Dreikorn must be reckoned as susceptible (23·5, 22, 20, and 19·1, respectively). The immersion of Hirschbach seed-grain for 30 minutes in 0·25 per cent. germisan reduced the incidence of infection from 27·7 per cent. in an untreated lot to 1·3 per cent.; the corresponding figures for 0·125 per cent. abavit (30 minutes), 0·2 per cent. ceretan [the Austrian name for ceresan] (30), 0·25 per cent. formalin (15), and 0·2 per cent. salvocer [ibid., xv, p. 569; xvi, p. 88] being 1·4, 1·7, 1·6, and 1·8 per cent., respectively. The freedom from infection ensured by seed treatment is thus in no case comparable to that arising from natural resistance to the pathogen.

KREBS (J.). **Untersuchungen über den Pilz des Mutterkorns Claviceps purpurea Tul.** [Studies on the ergot fungus *Claviceps purpurea*.]—*Ber. schweiz. bot. Ges.*, xlv, pp. 71–165, 2 diags., 14 graphs, 1936.

An exhaustive, fully tabulated account is given of the writer's comparative studies on *Claviceps purpurea*, *C. microcephala* [*R.A.M.*, xii, p. 294] and *C. paspali* [ibid., xvi, p. 36]. The material of the first-named species comprised three strains isolated by McFarland in the United States from *Bromus inermis*, *Festuca elatior*, and *Poa pratensis* [ibid., i, p. 109], two (HK and U) isolated from rye in Switzerland [ibid., iii, p. 85] and Hungary [ibid., iv, p. 181; xiv, p. 93], respectively, and two (Secale I and II) of unknown origin. One strain described by McFarland as *C. purpurea* from *Paspalum laeve* undoubtedly belongs to *C. paspali*, while another from *Glyceria borealis* may be identical with *C. wilsoni* Cooke, occurring in England on *G. fluitans* (*Gdnrs' Chron.*, iv, pp. 774, 807, 1875), or merely a physiologic form of *C. purpurea* distinct from that attacking rye. *C. microcephala* was isolated from *Phragmites communis*.

Two media were used for cultural investigations, namely, malt-agar or solution and Kirchhoff's cane sugar asparagin-agar [ibid., viii, p. 561]. The various strains exhibited striking differences in their physiological reactions in pure culture, especially as regards temperature. Thus the minimum for some strains of *C. purpurea* was —1° C., that of others and of *C. microcephala* 3°, while *C. paspali* made no growth below 6°. The optimum for *C. purpurea* ranged from 21° to 27° (12° to 24° for *C.* (?) *wilsoni*), while both *C. microcephala* and *C. paspali* developed

most abundantly at 24°. Marked differences in reaction to the hydrogen-ion concentration of the medium were further observed between *C. purpurea* from Swiss rye, *C. microcephala*, and *C.* (?) *wilsoni*, the optima for the two first-named ranging from P_H 5·21 and 5·68 and from 5·42 to 6·33, respectively, while the growth of the last was not appreciably influenced by the degree of acidity of the substratum. On the basis of temperature relations, food requirements, and colony type in pure culture two groups are clearly distinguishable within the physiologic species *C. purpurea* f. sp. *secalis*, viz., one isolated from rye sclerotia and the other originating on the wild grasses, *Poa pratensis*, *B. inermis*, and *F. elatior* [ibid., ii, p. 116].

In experiments on the germination of sclerotia of *C. purpurea*, Swiss and Czecho-Slovakian material exposed for one or three months to a temperature of −1° and then transferred to the greenhouse or garden, gave in one test 80 to 90 per cent. germination in garden soil, 30 per cent. in sand, and only 5 to 10 per cent. in quartz sand. A temperature range of 9° to 15° following one month's freezing, was most conducive to germination, which was inhibited at 18° and upwards; at and above 21° the sclerotia were severely damaged by moulds (especially at 27°), while at 33° *Cephalothecium* [*Trichothecium*] *roseum*, the agent of the so-called 'red ergot', developed in profusion. Perithecial formation, on the other hand, is favoured by a higher temperature.

In plots of winter rye there was a progressive augmentation in the ergot yield with each increase in the planting distance (10, 20, and 30 cm. as compared with the normal density of 1·3 kg. per are [100 sq. m.]) due to the irregular tillering of the crop which prolongs the flowering period and thus affords greater scope for secondary infection. In summer rye, on the other hand, the highest yields were obtained from densely sown plots, since the sparse planting resulted in large gaps and a heavy reduction of earing. The maximum ergot yields were secured from plots receiving liberal quantities of a complete fertilizer.

A positive correlation was shown to exist between the number of sclerotia in an ear and their total weight, so that mass infection, given a reliable means of inducing it should facilitate the procurement of ergot for medicinal purposes [ibid., ii, p. 400; xvi, p. 32]. A very close correlation was further demonstrated between the incidence of infection by *C. purpurea* and the relative ergot weight (expressed as a percentage of the total grain weight) of an ear, thereby affording statistical confirmation of the strict reciprocity between the development of the parasite and that of the host. There was a negative correlation between ear size and ergot infection, due to the fact that secondary infection by *C. purpurea* ('honeydew' conidia) the chief source of ergot, involves exclusively the late maturing tillering axes which always produce fewer flowers than the primary ones.

Schultz (W.). **Maisbeulenbrand (Ustilago zeae).** [Maize boil smut (*Ustilago zeae*).]—*Forschungsdienst*, iii, 3, pp. 143–151, 1937.

The writer enumerates and briefly summarizes the contents of 64 papers dealing with maize smut (*Ustilago zeae*), the first record of which in Germany [*R.A.M.*, xvi, p. 245] is stated to date from 1833.

Ivanoff (S. S.). **Resistance to bacterial wilt of open-pollinated varieties of sweet, dent, and flint Corn.**—*J. agric. Res.*, liii, 12, pp. 917–926, 2 figs., 1936 (issued February, 1937).

An account is given of experiments in 1935 at the Wisconsin Agricultural Experiment Station, in which the resistance was tested by artificial inoculations [*R.A.M.*, xiii, p. 390] of 92 sweet, 17 dent, and 11 flint maize varieties [an alphabetical list of which is given] to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti* [ibid., xvi, p. 167 and next abstracts]. The results showed that the varieties in the three groups varied considerably in resistance, which was found to be highly correlated with the factors for height and lateness of the different varieties, independently of the group to which these varieties belonged. No difference was observed in the type and degree of resistance between the open-pollinated field maize, on the one hand, and that of open-pollinated sweet and flint maize, on the other. Of the varieties tested, those showing an index of resistance of 85 (compared with 100 for plants appearing normal), or above, included Golden Sugar (Ford), Honey June, Money Maker, Surecropper Sugar, Tucker Favourite (all sweet varieties); Funk 176 A, Iowa hybrids 931, 939, 942, Wisconsin hybrid $(A \times Hy) \times R_3$ (dent varieties); and Kutias (flint).

Ivanoff (S. S.) & Riker (A. J.). **Resistance to bacterial wilt of inbred strains and crosses of sweet Corn.**—*J. agric. Res.*, liii, 12, pp. 927–954, 3 figs., 1936 (issued February, 1937).

A fully tabulated account is given of experiments from 1933 to 1935, inclusive, which were carried out to test the resistance to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xv, p. 434 and preceding and next abstracts] of approximately 1,000 inbred strains of sweet maize and 1,000 F_1 hybrids and top crosses of the Golden Bantam type. Preliminary trials indicated that artificial inoculation had certain important advantages over natural infection as a method for testing resistance. The inbred strains were found to vary widely in their resistance, the taller strains, as a rule, being more resistant than the shorter, and the later maturing strains than the earlier. The hybrids and top crosses likewise showed considerable variations in resistance, the resistance being inherited from the inbred parents, and apparently was generally dominant in the hybrids. Tall and late hybrids, as a rule, were more resistant than the short and early hybrids, but hybrids produced from highly resistant inbreds usually showed high resistance independently of their degree of earliness or lateness. Highly resistant hybrids were mostly late but a few were early.

McNew (G. L.). **Isolation of pathogenic variants from pure cultures of Bacterium stewarti.**—Abs. in *Phytopathology*, xxvii, 2, p. 135, 1937.

Differences in pathogenicity of pure cultures of *Bacterium* [*Aplanobacter*] *stewarti* [see preceding abstracts] were determined by the average number of necrotic lesions per leaf produced by the inoculation of Golden Bantam sweet corn [maize] plants. Two of the variants derived from a pure culture by single-colony isolation, repeatedly induced 0·02

and 1·00 lesions per leaf, respectively, in inoculation tests extending over a year, and in turn gave rise to other variants by the same process. Variants of all degrees of pathogenicity were isolated from infected plants, most of those derived from a virulent strain resembling the original culture in this respect. The proportion of extreme variants from this virulent culture was reduced by host passage. Most of the variants isolated from a plant infected by a weakly pathogenic culture were more virulent than the original.

SHERBAKOFF (C. D.) & MAYER (L. S.). **Black ear rot of Corn.**—*Phytopathology*, xxvii, 2, p. 207, 1 fig., 1937.

Helminthosporium turcicum, well-known as the agent of leaf blight of maize [*R.A.M.*, xv, pp. 201, 746], was isolated in 1931 at the Tennessee Agricultural Experiment Station from severely blackened and rotted ears in only 5 out of nearly 500 lines of the Neal's Paymaster variety. This is believed to be the first record of the fungus as the cause of ear rot of maize.

STOREY (H. H.). **A new virus of Maize transmitted by Cicadulina spp.**—*Ann. appl. Biol.*, xxiv, 1, pp. 87–94, 1 pl., 1937.

This is a full report of the author's studies on the new mosaic-like disease of maize, termed by him 'mottle', a summary account of which was recently published [*R.A.M.*, xv, p. 529]. Owing to the transitory and slight nature of the symptoms, the existence of the disease in the field is only revealed by the fact that naturally occurring leafhoppers (*Cicadulina mbila*, *C. zeae*, and *C. storeyi*) may carry the virus, which so far has only been found in one locality near Tanga, Tanganyika Territory. Special tests showed that inactive races of the insect vectors usually fail to transmit the virus, although rare exceptions to this rule have been met. It was further shown that maize may be infected either simultaneously or consecutively with both the mottle and the streak viruses, the presence of one virus in a plant not preventing the development of the other, although under certain conditions the mottle virus may cause a significant delay in the development of the streak symptoms. The presence of either virus in one insect does not prevent it from taking up and transmitting the other.

STRICKLAND (A. J.). **Mottle leaf of Citrus—preliminary note on correction in South Australia with zinc sprays.**—*J. Dep. Agric. S. Aust.*, xl, 7, pp. 579–585, 7 figs., 1937.

Satisfactory control of mottle leaf on 60 seven-year old late Valencia orange trees growing in South Australia was given by an application in March, 1936, of a mixture consisting of zinc sulphate 10 lb., hydrated lime 5 lb., or the same at half strength with 3 galls. skim milk per 100 galls water followed by a second application of the full strength mixture or one of zinc oxide (3 lb. per 100 galls. water) early in October. Similar results were given by the same treatments in three other localities. The treatment resulted in a marked stimulation of the roots, which were originally heavily infested with nematodes (*Tylenchulus semipenetrans*).

Reichert (I.) & Perlberger (J.). **The prevention of diseases in Citrus seedbeds.**—*Hadar*, ix, 11–12, pp. 253–259, 278–281, 17 figs., 1936. [Received May, 1937.]

Descriptions are given of the symptoms of damping-off, root diseases, stem blight (*Phytophthora parasitica* and *P. citrophthora*) [*R.A.M.*, xvi, p. 34] and 'albinism' (absence of chlorophyll in the leaves and stems) of citrus seedlings in Palestine. Preventive cultural measures include sowing in open seed-beds in the spring, using sandy clay covered with 1 cm. of pure sand and incorporating two-year-old manure; for winter sowing under glass-covered frames, the woodwork should be treated with carbolineum and a south-east or south-west aspect chosen. Seed should be taken from selected fruit, immersed for 30 minutes in ceresan (effective against albinism as well as pathogenic fungi) at a strength of 1 in 1,000 for sweet lime [*Citrus limetta*] and 1 in 2,000 for sour orange [*C. aurantium*], and sown in rows 4 to 5 cm. apart. Ceresan may also be used at a concentration of 1 in 500 for disinfection of the fruit destined for seed ($\frac{3}{4}$ to 1 hour), the treated fruit being preserved from decay as long as 6 months, and at 1 in 5,000 (8 l. per sq. m.) for soil treatment, two applications being given at a 48-hour interval; formalin 1 in 200 is also useful for this purpose. The seedlings should be given fortnightly applications of 0·5 per cent. Bordeaux mixture, increased up to 0·75 per cent. for outbreaks of disease, when the soil should also be treated with Bordeaux or 1 in 3,000 ceresan (3 to 4 l. per sq. m.).

Simmonds (J. H.). **Citrus diseases.**—*Qd agric. J.*, xlvii, 2, pp. 142–153, 2 pl., 1937.

Brief, popular notes are given on the symptoms and control of the following citrus diseases in Queensland: orange black spot (*Phoma citricarpa*) [*R.A.M.*, xvi, p. 247] and melanose (*Phomopsis* [*Diaporthe*] *citri*) [ibid., xvi, p. 395], scab of lemons and mandarin oranges (*Sporotrichum citri*) [*Sphaceloma fawcettii scabiosa*: ibid., xvi, p. 169], brown spot of Emperor mandarin oranges due to an unknown cause, moulding caused by *Penicillium digitatum* and *P. italicum* [ibid., xvi, p. 233], brown rot (*Phytophthora citrophthora* or *P. parasitica*) [see preceding abstract] and stem rot (*D. citri* or *Diplodia natalensis*) [ibid., xv, p. 797], pink disease (*Corticium salmonicolor*) [ibid., xiv, pp. 146, 627], psorosis of sweet orange, mandarin, and grapefruit [ibid., xvi, p. 367], exanthema [ibid., xiv, pp, 505, 628], mottle leaf [ibid., xvi, p. 93], collar rot and gumming of lemon, mandarin, and sweet orange [? *P. parasitica*: ibid., xiii, p. 356], root rot (*Armillaria mellea*), sooty mould (*Capnodium* spp. and other fungi), and smoky blotch due to a species of *Leptothyrium*.

Bitancourt (A. A.) & Jenkins (Anna E.). **Sweet Orange scab caused by Elsinoe australis.**—*J. agric. Res.*, liv, 1, pp. 1–18, 13 pl. (2 col.), 1 map, 1937.

This is a full and profusely illustrated account of the authors' investigation on the sweet orange scab caused by *Elsinoe australis* [*R.A.M.*, xvi, p. 94], which has been identified from Brazil (States of São Paulo, Rio Grande do Sul, Minas Geraes, Rio de Janeiro, and in the Districto Federal), from Argentina, Paraguay, and apparently also from Uruguay.

In São Paulo the sweet orange varieties known to be affected in the field are Bahia Navel, Pera, Sabará, Selecta, São Sebastião, Santos, Lima, and Mangaratiba, and the Abacaxi variety has been experimentally infected; the disease was also observed there on other kinds of citrus, e.g., the tangerine of Brazil (*Citrus nobilis* var.), tangerona (*C. nobilis*×*C. sinensis*), a sweet lime known as lima da Persia (*C. aurantifolia*), a sour lime known as limão seda (*C. aurantifolia*), laranja cravo (probably a variety of *C. nobilis*), and a pointed-leaf papeda (*C. hystrix*). In Argentina scab was found on the sweet orange varieties Ruby Blood, Sweet Mediterranean, Valencia, and Criolla. The chief economic importance of the trouble is that it severely blemishes the fruit, rendering unfit for export as much as one-third of the crop in numerous groves in São Paulo, while in some others from 50 to 60 per cent. is more or less badly scabbed. The leaves and twigs of the trees are rarely affected. The symptoms of the disease are described in detail.

The results of comparative studies showed that *E. australis* differs in cultural characters from *E. fawcetti* [loc. cit.], and that the strains of the former may be divided into two main groups, one of which gives a pulvinate, and the other a convolute type of growth in culture. The fungus also produced saltations in pure culture. While both *E. australis* and *E. fawcetti* grew at temperatures ranging from 9·5° to 39·5° C., the best growth of the former occurred between 24·5° to 29°, with an optimum probably near 26°, and the latter grew best at 20° to 24·5°, the optimum probably being near 21°. In pathogenicity tests, *E. australis* gave positive results on sweet orange, tangerine, and 'laranja cravo', and *E. fawcetti* on 'laranja cravo' and sour orange, but not on sweet orange; neither was capable of attacking the avocado pear.

X-ray machine shows inside characters of Citrus fruits.—*Calif. Citrogr.*, xxii, 4, p. 142, 2 figs., 1937.

A description is given of an X-ray machine, developed by the General Electric Corporation and installed in the laboratory of the California Fruit Growers' Exchange, which permits examination of the inside appearance of oranges and lemons on a fluoroscopic screen, and hence the detection and elimination of unsatisfactory fruits without cutting or waste. Good fruit with heavy juice appears dark on the screen, while a light appearance is given by immature, frozen or granulated fruit, and by fruit low in sugars. Any condition causing cell breakdown can be detected, internal decline of lemons being readily disclosed, but not *Alternaria* rot [*A. citri*]. It is estimated that at least 1½ car loads of fruit can be passed through the machine in a day.

Lynch (L. J.). **The detection of wounding in Citrus fruits—preliminary note.**—*J. Coun. sci. industr. Res. Aust.*, x, 1, pp. 82–83, 1937.

Wounds in citrus fruits immersed in solutions of celliton yellow, acriflavine, or auramine were found to exhibit marked fluorescence when exposed to ultra-violet light. This method of detection is rapid, and permits the simultaneous examination of a tray of 50 fruits.

McDonald (J.). **Report on Coffee berry disease investigations in 1936.** —Reprinted from *Mon. Bull. Coffee Bd Kenya*, iii, 26, 4 pp., 1937.

In 1936, the amount of coffee berry disease [*Glomerella cingulata*: *R.A.M.*, xvi, p. 171] on the different varieties at the Sotik experiment station Kenya, estimated as percentages of diseased berries, was as follows: Blue Mountain imported seed (2 plots), 3·1 and 4 (or 8·2 including two abnormally infected bushes), local seed (2 plots) 4·4 and 5·3, Kent's Arabica (2 plots) 6·8 and 17·9, Plateau Bronze (2 plots) 6·8 and 9·2, Guatemala 8·1, Padang 11·7, Kenya Selected (2 plots) 13·6 and 33·7, and Bourbon 16·1. Neither applications of large amounts of organic nitrogen nor reduction in the nitrogen supply [ibid., xiii, p. 217] affected either the yield or the amount of infection that developed. Plots given dressings of sulphate of ammonia averaged 17·1 per cent. infection in 1936 as against 13·3 per cent. in the untreated control; application of zinc sulphate increased the incidence of the disease from 9·9 to 22·2 per cent. Plots given a mixture of 18 minor elements in addition to other substances also developed more infection than the untreated controls. In spraying experiments, plots treated with 1 per cent. Bordeaux mixture in January, May, and July averaged 4·4 per cent. infection, the corresponding figure for a plot similarly sprayed in March, May, and July being 11·5 per cent., and for the control 17·3 per cent.

Rudin (W.). **Topsterftebestrijding in de practijk.** [Top die-back control in practice.]—*Bergcultures*, xi, 9, pp. 289–291, 1937.

Failure to observe certain precautions and to discriminate between different stages of top die-back [*Rhizoctonia*] in Dutch East Indian coffee plantations [*R.A.M.*, xvi, p. 160] is stated to have brought H. R. A. Muller's method of control by the timely excision of diseased material into unmerited disrepute. Practical recommendations are made for the rational application of the system, and stress is laid on the necessity of burning all infected refuse: in a case known to the writer the neglect of this measure led to an increase in the incidence of die-back from 5 to 78 per cent. within a few months, whereas a drop from 7 to 3 per cent. was registered in another planting where the debris was destroyed.

De Fluiter (H. J.). **Corticium gardeniae Zimm. op Koffie.** [*Corticium gardeniae* Zimm. on Coffee.]—*Arch. Koffiecult. Ned.-Ind.* [x, 4], pp. 14–21, 7 figs., 1936. [Abs. in *Zbl. Bakt.*, Abt. 2, xcv, 21–26, p. 505, 1937.]

Corticium gardeniae, hitherto recorded only on *Gardenia florida*, was found in elevated plantations in Java producing silvery-white hyphae, 1 to 2 mm. in diameter, eventually developing into 'knots', on the stems and under-sides of the branches and petioles of coffee. The leaves are penetrated by the mycelium only after sclerotial formation, when they turn black and die, but are caught up and prevented from falling by the hyphae. Control consists in the excision of diseased material, spraying with Bordeaux mixture, and conservative pruning of the foliage of young plants.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas (Schluss.).** [Coffee pests and diseases in Africa. (Conclusion.).]—*Tropenpflanzer*, xl, 2, pp. 47–65, 8 figs., 1937.

Continuing his survey of African coffee pests and diseases [*R.A.M.*, xvi, p. 247], the writer briefly summarizes the available information on the root rots due to *Armillaria mellea* [ibid., xv, p. 261], *Fomes lamaensis* [*F. noxius*: ibid., xiv, p. 31; xv, p. 16], *Macrophomina phaseoli* [ibid., xiii, p. 114], *F. lignosus* [ibid., xv, p. 16], *Ganoderma* sp., *Rosellinia necatrix* [ibid., xv, p. 283], *R. aquila* [ibid., viii, p. 378], *Ustulina zonata* [ibid., ii, p. 260], *Polyporus coffeae* [ibid., xiv, pp. 31, 357], and *Bacillus coffeicola* [ibid., xii, p. 91], and on the seed-bed infections caused by *Rhizoctonia* [*Corticium*] *solani* [ibid., xv, p. 632], *Fusarium* [? *lateritium* var. *longum*: ibid., xv, p. 780], and *Cercospora coffeicola* [ibid., xvi, pp. 247, 314].

WATKINS (G. M.). **Penetration and invasion of Phymatotrichum omnivorum in Cotton roots grown under pure-culture conditions.**—Abs. in *Phytopathology*, xxvii, 2, p. 143, 1937.

Sections through cotton seedling roots grown in nutrient agar and inoculated with a pure culture of *Phymatotrichum omnivorum* [*R.A.M.*, xvi, p. 176] showed that individual hyphae of the mycelial weft may penetrate the epidermal cell wall or root hairs. From the epidermis they grow through and between the cortical cells and finally invade the endodermis and enter the stele, where longitudinal progression has been observed in the various tissues of the vascular cylinder. The infected cells are ultimately killed, and in the later stages are almost entirely filled with hyphae. The penetration of the host cells may be accomplished by means of constricted hyphal tips, but definitely organized haustoria were not observed.

PELTIER (G. L.). **Distribution and prevalence of Ozonium root rot in the shelter-belt zone of Texas.**—*Phytopathology*, xxvii, 2, pp. 145–158, 2 pl., 1 fig., 1 map, 1937.

The areas within the shelter-belt zone of southern Oklahoma and Texas infested by root rot (*Ozonium* [*Phymatotrichum*] *omnivorum*) [see preceding abstract] were mapped out with a view to their avoidance for the cultivation of susceptible crops, such as cotton. Susceptible plants were used as indicators of infested territory and the universal distribution of three susceptible weeds (*Solanum eleagnifolium*, *Ambrosia* spp., and *Chenopodium album*) in virgin, pasture, waste, and cultivated lands was of material assistance in the detection of the fungus, useful indications as to the presence of which were further afforded by *Xanthium* spp., *Physalis* spp., *Helianthus* spp., and *Cirsium* spp. A section of land was deemed to be infested when the characteristic mycelial weft was observed on one or more diseased plants, or when conidial mats were found. On this basis the approximate limits of root rot infestation were fixed at south of 34° N. lat. and east of the 100th meridian, and the following are some of the resistant trees and shrubs recommended for planting in the affected sections: *Toxylon pomiferum* [*Maclura aurantiaca*], *Platanus occidentalis*, *Juniperus virginiana*, *J. scopulorum*,

Symphoricarpos orbiculatus, green ash (*Fraxinus pennsylvanica lanceolata*), *Hicoria* [*Carya*] *pecan*, *Thuja orientalis*, *Bumelia lanuginosa*, *Pistacia texana*, *Chilopsis linearis* [*C. saligna*], and *Tamarix gallica*. Among the more susceptible hosts of the fungus may be mentioned *Populus* sp., *Gleditsia triacanthos*, *Robinia pseud-acacia*, *Cornus asperifolia*, *Syringa* sp., *Ulmus americana*, *U. parvifolia*, *Morus alba tatarica*, *Catalpa speciosa*, *Juglans nigra*, *J. rupestris*, *Pinus nigra austriaca*, *P. ponderosa*, *Cupressus arizonica*, *Cercis canadensis*, and *Prunus angustifolia*. It was repeatedly observed that when root rot occurs near the headwaters of a stream it is usually distributed throughout the drainage basin, the incidence of the disease increasing at the lower levels. The sharp delimitation between infested and non-infested areas was very remarkable.

Progress Reports from Experiment Stations, season 1935–1936.—v+ 140 pp., 1 plan, 7 graphs, London, Empire Cotton Growing Corporation, 1937.

These reports [cf. *R.A.M.*, xv, p. 437] contain, *inter alia*, the following items of phytopathological interest.

In further experiments at Barberton, South Africa, on the transmission of internal boll disease (*Nematospora gossypii*) by *Dysdercus*, the results obtained suggest that transmission is purely mechanical and due to contamination of the mouth-parts of the insects, infection not persisting from one instar to the next owing to shedding of the exuvium during ecdysis. If spores passed from the midgut to the salivary glands the nymph might be expected to remain infected throughout life.

In a rotation experiment at Magut, Natal, a low yield from land cropped previously with sunflowers was attributed to the *Verticillium* wilt previously reported [loc. cit.]; the experiment comprised eight replications on the randomized block basis, with six different previous croppings, and the wilt was practically confined to the sunflower plots. Sunflowers are to be discontinued as a rotation crop.

In Southern Rhodesia the total adult stainer (*D. fasciatus*, *D. intermedius*, and *D. superstitiosus*) population was under 500 per acre during the first four weeks that most of the bolls were developing and then rose to about 2,500 per acre by mid-May, remaining at this level until about mid-June; thereafter (consisting almost entirely of *D. fasciatus*) it became markedly more numerous and decreased at the end of July and in August. Only about 5 per cent. of the bolls were moderately or heavily stained in April and the first two weeks of May, the figure rising to 20 per cent. in mid-June, when most of the crop was matured. The loculi of matured bolls (not damaged visibly by bollworm punctures) in which the seed cotton was unstained or lightly stained amounted to between 80 and 90 per cent. of the crop.

In breeding work at Serere, Uganda, S.P. 102, derived probably from a hybrid between S.G. 29 and an unknown cotton was outstanding as regards lint length and blackarm [*Bacterium malvacearum*] resistance. In the F_1 generation from the Serere hybrids the S.G. 29 elements increased susceptibility to blackarm. Also, the F_1 plants from two resistant parents showed more susceptibility than either parent, this observation showing the necessity for sustained re-selection against

blackarm, as deterioration is likely to set in as soon as open crossing is permitted in the field. In a miniature trial all the 13 varieties tested were much more resistant to blackarm than S.G. 29 [ibid., xvi, p. 235] and gave from 19 to 84 per cent. higher yields.

At Morogoro, Tanganyika, large quantities of cassava seed were inter-sown between rows of setts affected with mosaic [ibid., xvi, pp. 87, 301]; exceptionally good germination resulted, and many seedlings have remained healthy. Over 100 seedlings exposed for eighteen months without becoming affected have been replanted in progeny plots with surrounding infected rows.

In a test made in Nigeria the cotton strains D–31, E–31 (derived from Standard and immune from leaf curl), and S.G. 27 (introduced from Uganda in 1931) showed, respectively, 0·4, 0, and 4·2 per cent. leaf curl, as against 3·2 per cent. in the case of Standard ordinary commercial seed; in the previous season Standard and D–31 had shown 14·2 and 1·8 per cent. leaf curl, respectively. The increased lint yields per acre of D–31 over Standard were 39, 40, and 41 per cent. in 1933, 1934, and 1935, respectively, but the former strain produces inferior yarn to Standard, E–31 gave markedly better yarn than D–31, while S.G. 27 gave equal yields of lint to Standard in 1932 and 1935, and of better quality, though with this strain there is a danger of reduced yield owing to leaf curl.

Masera (E.). **La 'Beauveria globulifera (Speg.) Picard' parassita del 'Bombyx mori L'.** [*Beauveria globulifera* (Speg.) Picard a parasite of *Bombyx mori* L.]—*Annu. Staz. bacol. sper. Padova*, xlviii, pp. 381–397, 1936. [Abs. in *Ber. wiss. Biol.*, xli, 9–10, p. 671, 1937.]

The writer's cultural experiments and microscopical and biological studies at Padua showed that *Beauveria globulifera* [*R.A.M.*, xiii, p. 302] occurs in a parasitic form on silkworms, the strain isolated from which is designated var. *bombycis*.

Bory (L.). **Mycose cutanée et sous-cutanée. Aspergillose possible.** [Cutaneous and subcutaneous mycosis, possibly aspergillosis.]—*Bull. Soc. franç. Derm. Syph., 1937*, 2, pp. 277–283, 4 figs., 1937.

From recurrent abscesses in the cervico-maxillary region of a 56-year-old woman the writer isolated on Sabouraud's agar and other media an *Aspergillus* resembling *A. fumigatus* [*R.A.M.*, xvi, p. 317] in its mode of development, but the species under observation prefers a relatively low temperature (25° C.) instead of 37° at which the *A. fumigatus* thrives; no attempt is made at closer identification of the fungus at the present stage. The case is of interest on account of the comparative rarity of cutaneous aspergilloses.

Marquardt (F.). **Die Kultur des Mikrosporon furfur.** [The culture of *Microsporon furfur*.]—*Derm. Wschr.*, civ, 6, pp. 117–180, 4 figs., 1937.

Pure cultures of a fungus presenting the typical features of *Microsporon* [*Malassezia*] *furfur* [*R.A.M.*, xv, p. 295] were obtained from 5

out of 11 cases of pityriasis versicolor on Grütz's medium with the following composition: 9 gm. agar, 2·5 gm. each of peptone and sodium chloride, 2·5 c.c. glycerine, and 30 gm. Nervina malt per 500 c.c. distilled water. At the tenth day the colonies were brown and radially sulcate, with a button-like central protuberance, and consisted at this stage of a dense weft of long, septate hyphae and an abundance of spores. One to two weeks later the surface of the culture was dark brown, crumbly, and composed entirely of spores, which were readily subculturable and produced new colonies, the hyphae proceeding from a protrusion in a manner strongly reminiscent of the emergence of a shoot from a bulb.

Burkwall (H. F.). **Tinea imbricata in Hainan.**—*Chin. med. J.*, li, 1, p. 91, 1937.

Notes are given on two cases of tinea imbricata or tokelau examined by the writer in Hainan, China, and attributed by him to *Endodermophyton* [*Trichophyton*] *concentricum* (*E.* [*T.*] *indicum* and *E.* [*T.*] *tropicale*) [*R.A.M.*, xiv, p. 308; xvi, p. 40].

Milochevitch (S.). **Une nouvelle espèce de Trichophyton mégasporé à culture glabre, T. immergens n.sp.** [A new species of megasporous *Trichophyton* of smooth aspect in culture, *T. immergens* n.sp.]—*C. R. Soc. Biol., Paris*, cxxiv, 5, pp. 469–471, 1937.

From a female patient at Belgrade suffering from circinate herpes of the right leg the writer isolated a *Trichophyton* forming on glucose agar raised, greyish colonies, covered with a sparse, white down (invisible to the naked eye), with a broad central zone of large, uneven, immersed rays. On maltose agar the pale yellow centre of the colony is surrounded by a ring of thick, white down, with a narrow band of short, even, densely aggregated rays at the periphery. On natural media, such as wheat ears [*R.A.M.*, xvi, p. 383 and next abstracts] the fungus develops simple spore clusters (*Acladium* type), compound clusters, long, characteristic tendrils, and numerous thick, crozier-shaped hyphae. The fungus is considered to be a new species and is named *T. immergens*.

Catanei (A.). **Sur l'appareil conidien des Trichophyton violaceum et glabrum.** [On the conidial apparatus of *Trichophyton violaceum* and *glabrum*.]—*C.R. Soc. Biol., Paris*, cxxiv, 4, pp. 341–342, 1937.

Twenty-three strains of *Trichophyton violaceum* [*R.A.M.*, xvi, p. 383 and next abstracts] from Algeria and Greece were cultured on a medium composed of 60 gm. rice flour and 20 gm. agar in 1 l. water, under which conditions they produced smooth, velvety, pale mauve colonies, covered in a few instances with a short down. At the end of a month five of the recently isolated strains had formed numerous conidia of the *Acladium* type. One of the Algerian *T. violaceum* strains formed abundant conidia in culture, but subcultures on glucose agar produced only smooth colonies devoid of spores [cf. preceding abstracts]. Two out of four strains of *T. glabrum* [ibid., xv, p. 151; xvi, pp. 40, 101] also produced reproductive organs on the rice flour medium. *T. violaceum* and

T. glabrum may now be definitely ranged in the endothrix section of *Trichophyton* [ibid., xvi, p. 40].

CATANEI (A.). **Sur la résistance des champignons des teignes dans le milieu extérieur.** [On the resistance of ringworm fungi in the external medium.]—*C.R. Soc. Biol., Paris*, cxxiii, 35, pp. 1043–1044, 1936.

The question of the duration of viability of the ringworm group of fungi after severance from the host is of great importance from the epidemiological standpoint. *Ctenomyces mentagrophytes* (*Trichophyton radiolatum*) [*T. mentagrophytes*: *R.A.M.*, xvi, p. 317] was found to remain viable on a fragment of reed in the laboratory from June, 1928 to October, 1931, and on a piece of wood from June, 1930 to November, 1932. Viable cultures of *T. violaceum* and *T. glabrum* [see preceding abstracts] were further secured from infected hair after a year and nine months in eight instances out of 15, while *T. plicatile* [ibid., xvi, p. 383] grew after six months' preservation. Three out of seven cultures from cases of microsporosis [*Microsporon* spp.] were viable after six months, one year, and 1½ years, respectively, while only one out of ten from favus [*Achorion* spp.] squamae developed after 11 months.

OLÁH (D.). **Einfluss der Temperatur und der Nährbodenfeuchtigkeit auf die makroscopische Form der Pilzkolonien.** [The influence of temperature and humidity of the nutrient medium on the macroscopic form of fungus colonies.]—*Derm. Wschr.*, civ, 6, pp. 185–189, 10 figs., 1937.

During the winter months in Hungary laboratory temperatures (at which the dermatophytes are commonly cultured) are liable to undergo extensive fluctuations, sometimes sinking to 10° or even 8° C. during the night. Under these conditions the macroscopic features of certain representatives of the groups under observation presented striking variations. A strain of *Microsporon audouini* [*R.A.M.*, xvi, p. 316], for instance, entirely ceased growth during three winter months after forming six radial grooves typical of *M. tardum* [ibid., xiii, p. 577], but resumed development in the spring. In other cultures of *M. audouini* the characteristic radial furrows were replaced by the concentric circles associated with *M. iris*. This phenomenon suggests that *M. tardum* and *M. iris* may be merely variants of *M. audouini*. The typical 'tobacco pouch' cultures of *Trichophyton regulare* assumed various anomalous forms resembling, e.g., *T. exsiccatum* Ballagi, *T. cerebriforme*, and *T. crateriforme* under the influence of desiccation of the medium, while *T. violaceum* [see preceding and next abstracts] and Kaufmann-Wolf's *Epidermophyton* [ibid., xv, pp. 219, 802] are also liable to modifications of various kinds in response to changes in the two environmental factors under discussion.

LANGERON (M.). **Observations statistiques et mycologiques sur les teignes humaines au Maroc.** [Statistical and mycological observations on human ringworms in Morocco.]—*C.R. Acad. Sci., Paris*, cciv, 5, pp. 372–374, 1937.

The examination of 464 cases of ringworm in Spanish Morocco

[*R.A.M.*, xvi, p. 39] yielded 160 of trichophytosis, 157 of which were due to *Trichophyton violaceum* and *T. glabrum* [see preceding and next abstracts], and 304 of favus, 175 caused by *Achorion schoenleini* and the remaining 129 falling into five cultural types: (1) *A. milochevitchi* (colonies surrounded by a broad immersed zone), found in 77 cases compared with 55 out of 270 in the French zone; (2) *A. brumpti*, with granular, yellowish, profusely developed colonies, isolated from 36 of the French and 6 of the Spanish cases; (3) *A debueni*, characterized by small, farinaceous colonies (31 French, 22 Spanish); (4) *A. pittalugai*, with markedly crateriform colonies (6 French, 15 Spanish); and (5) *A. talicei*, having colonies shaped like wheels, with rims and thick spokes. The complete absence of *A. schoenleini* from the French Moroccan material is noteworthy. *T. violaceum* and *T. glabrum* were also responsible for the relatively few cases of trichophytosis in French Morocco.

Takatsuki (S.). **Über die Dermatomykose und ihre Erreger in Sachalin.** [On dermatomycosis and its agents in Saghalien.]—*Jap. J. Derm. Urol.*, xl, 4, pp. 150–153, 1 col., fig., 1936.

Of the 78 cases of juvenile dermatomycosis examined by the author in Saghalien in 1933, 56 were due to *Microsporon japonicum* [*R.A.M.*, xv, p. 580], 11 to *Trichophyton interdigitale*, 5 to *T. violaceum* [see preceding abstracts], 2 to *T. rubrum* [see next abstract], and one each to *T. glabrum*, *T. pedis* [ibid., xiii, p. 164], *Epidermophyton inguinale* [*E. floccosum*: ibid., xvi, p. 316], and *M. karafutoense* n.sp. The last-named forms on Sabouraud's glucose agar at 27° C. orange-yellow colonies, at first with a faint greenish tint covered with white down, later turning a more vivid orange in the centre, deep to pale yellow towards the periphery; five to six shallow grooves radiate from the central protuberances. Numerous pluriseptate spindles were observed, also (in hanging drops) racquet-shaped mycelia, a few aleuria, nodular organs, chlamydospores, and pectinate elements. The spores (2 to 3 μ in diameter) occur in masses at the roots of the infected hairs, the interior of which also shows a fungal network; the septate mycelium, 3 to 4 μ in diameter, is found in the epidermal scales. Inoculation experiments on guinea-pigs and cats gave positive results and the fungus was also transmitted to human patients.

Gougerot (H.), Blum (P.), & Duché [J.]. **Trichophytie circinée due au 'Trichophyton rubrum'.** [Circinate trichophytosis due to *Trichophyton rubrum*.]—*Bull. Soc. franç. Derm. Syph., 1937*, 2, pp. 267–269, 1937.

Clinical details are given of a case of ringworm of the neck in a 25-year-old Frenchwoman, who had never been abroad, due to *Trichophyton rubrum* [*R.A.M.*, xv, p. 439], an exotic fungus rarely recorded in Europe and the origin of which could not be traced.

Gougerot (H.) & Duché (J.). **Mycose sous-cutanée nouvelle due à 'Debaryomyces klöckerii'.** [A new subcutaneous mycosis due to *Debaryomyces kloeckerii*.]—*Bull. Soc. franç. Derm. Syph., 1937*, 2, pp. 266–267, 1937.

From chronic labial ulcers in an elderly male patient the writers

isolated on Sabouraud's glucose agar at 25° C. a fungus with a creamy-whitish mycelium composed of pseudo-hyphae with irregular cells, generally elongated and measuring 2 to 4 μ in diameter; echinulate ascospores (one in each irregularly shaped ascus), 2 to 2·5 μ in diameter, developed on Gorodkowa's agar. The organism is identified as *Debaryomyces kloeckerii*, apparently not hitherto known as an agent of cutaneous lesions.

Negroni (P.). **Mykologisches Studium des ersten argentinischen Falles von Chromomycosis Fonsecaea (n.g.) pedrosoi (Brumpt, 1921).** [A mycological study of the first Argentinian case of chromomycosis *Fonsecaea* (n.g.) *pedrosoi* (Brumpt, 1921).]—*Rev. Inst. bact., B. Aires*, vii, pp. 419–426, 1936. [Spanish. Abs. in *Zbl. Haut- u. GeschlKr.*, lvi, 2, p. 134, 1937.]

A fungus isolated in pure culture from the first case of chromomycosis observed in the Argentine agreed with Fonseca and Leão's description of *Acrotheca* [*Trichosporium*] *pedrosoi* [*R.A.M.*, xvi, p. 384] except for the occurrence of a dual type of fructification normally absent from *Acrotheca* and such related genera as *Hormodendrum* and *Trichosporium*. The name of *Fonsecaea pedrosoi* n.g., n. sp. is therefore proposed for the organism.

Takahashi (Y.). **Zur Chromoblastomykose. (II. Mitteilung.) Über Chromoblastomykose, hervorgerufen durch Hormodendrum japonicum n.sp.** [Second note on chromoblastomycosis. On chromoblastomycosis caused by *Hormodendrum japonicum* n.sp.]—*Jap. J. Derm. Urol.*, xli, 2, pp. 53–64, 7 figs., 1937.

Hormodendrum japonicum n.sp., isolated from an abscess on the right hand of a 77-year-old peasant, is characterized by olive-green hyphae, 2·5 to 5 μ in diameter, and by two kinds of fructification, blastospores and arthrospores. The blastospores are borne in branching chains on undifferentiated conidiophores and are mostly ovate, rarely ellipsoid or lemon-shaped, smooth, uni-, seldom bicellular, 3 to 8 by 2 to 5 μ, and denticulate at both ends. The concatenate arthrospores are globular, ovate or ellipsoid, olive-green, smooth, uni-, seldom bicellular, 4 to 10 by 3 to 4 μ, non-denticulate and more persistent than the blastospores. Terminal and intercalary, globular or oval, olive-green chlamydospores, 4 to 14 μ in diameter, occur in old cultures.

The fungus made good growth at 37° C. on Sabouraud's glucose and maltose agars, beer wort agar, Pollacci's medium, and other substrata, forming downy, brownish-green to greenish-grey, gradually darkening colonies, with a button-shaped or conical central protuberance and radial grooves terminating in dendriform elements. None of the sugars tested underwent fermentation. Positive results were obtained in inoculation tests on the patient and on laboratory animals; in the tissues of the latter the fungus formed brown to brownish-black spores, 4 to 10 μ in diameter.

Ciferri (R.) & Redaelli (P.). **Morfologia, biologia e posizione sistematica di Coccidioides immitis Stiles e delle sue varietà, con notizie sul granuloma coccidioide.** [The morphology, biology, and

systematic position of *Coccidioides immitis* Stiles and its varieties, with notes on coccidioidal granuloma.]—*Mem. R. Accad. Ital.*, vii, 13, pp. 399–475, 8 pl., 13 figs., 1936. [Received April, 1937.]

In this detailed account of a study of 15 strains of *Coccidioides immitis* [*R.A.M.*, xv, p. 503; xvi, p. 318] the authors, after pointing out that the only valid name for the monotypic genus is *Coccidioides*, state that the cultural characters were to a large extent constant for all the strains except Weidman's No. 2322, which they regard as a distinct variety and name *C. immitis* var. *pipkini* Cif. & Red.

The strains formed white, smooth, and simple colonies on media containing carbohydrates, and granulose-plicate on others, organic nitrogen being necessary for growth. They did not ferment carbohydrates, slowly alkalized the medium and liquefied gelatine, produced indol, and had no effect on milk. On ordinary media the morphological characters were extremely simple; regularly branched hyphae were present with a few, generally intercalary chlamydospores. More complex characters developed under special cultural conditions, Moore's strain from North America giving rise to small sporangia with zoospores. Zoospore conjugation in groups of two, occasionally three, was observed for the first time for this organism, but the further development of the gametes could not be followed. The formation of zoosporangia and endospores took place (except under special conditions) only in living animal tissues. Some strains were fatal to susceptible laboratory animals, while others were weakly pathogenic and formed few zoosporangia [ibid., xiv, p. 445]. The evidence demonstrated that the reputed ascus [ibid., xii, p. 170] is a sporangium, not an ascus.

The paper concludes with a full description of the family and species; a complete synonymy of *C. immitis*, including *Blastomycoides dermatitidis* Cast. (non *Blastomyces dermatitidis* Gilchrist & Stokes) [loc. cit.], *Geotrichum louisianoideum* [loc. cit.], *G. immite*, *G. dermatitidis* Cast. (non *Blastomyces dermatitidis* Gilchrist & Stokes), and *Scopulariopsis americana* [ibid., xiv, p. 100], and an account of the clinical and anatomical features of the disease. There is a bibliography of 90 titles.

Ciferri (R.) & Redaelli (P.). **Paracoccidioidaceae, n. fam., istituita per l'agente del 'granuloma paracoccidioide' (Paracoccidioides brasiliensis).** [Paracoccidioidaceae, n. fam., established for the agent of 'paracoccidioidal granuloma' (*Paracoccidioides brasiliensis*).]—*Boll. Ist. sieroter. Milano*, xv, 2, pp. 97–102, 1936. [German summary. Received April, 1937.]

A concise survey is given of the writers' studies on the cultural, morphological, and biological properties of four strains of *Paracoccidioides brasiliensis* [*R.A.M.*, xvi, p. 318], the agent of Brazilian paracoccidioidal granuloma, also known as Lutz's, Splendore's, or d'Almeida's disease. Special attention is paid to the mode of reproduction of the fungus in human tissue, and in this connexion the phenomenon of cryptosporulation is elucidated. Following a discussion on the relationships of *P. brasiliensis* with other protists, especially *Coccidioides immitis* [see preceding abstract] and *Amoebochytrium*, a new family, Paracoccidioidaceae, is established to accommodate the first-named organism in the ranks of the Chytridiales.

Ciferri (R.), Redaelli (P.), & Scatizzi (Ida). **Unità etiologica della malattia di Seeber (granuloma da Rhinosporidium seeberi) accertata con lo studio di materiali originali.** [The etiological unity of Seeber's disease (granuloma due to *Rhinosporidium seeberi*) confirmed by the study of original specimens.]—Reprinted from *Boll. Soc. med.-chir. Pavia*, xiv, 5, 24 pp., 1 pl., 1936. [Received April, 1937.]

Comparative histopathological and mycological studies on specimens of human and equine rhinosporidial granulomata established the etiological unity of the disease from both sources and its causation by *Rhinosporidium seeberi* (Wernicke 1903) Seeber 1912 emend. Ashworth 1923 [*R.A.M.*, xv, p. 803], as synonyms of which are listed *Coccidioides* sp. Seeber, *Coccidium seeberia* (Wernicke) Belou 1903, *R. kinealyi* Minchin & Fantham 1905, and *R. equi* Zschoschke 1913.

Redaelli (P.) & Ciferri (R.). **Argomenti a favore di una sistemazione del genere 'Blastocystis' nelle Algae.** [Arguments for placing the genus '*Blastocystis*' among the Algae.]—*Boll. Ist. sieroter. Milano*, xv, 3, pp. 154–170, 7 figs., 1936. [German summary. Received April, 1937.]

In this paper the authors give a full account of their morphological and cultural observations on which they base their view that the genus *Blastocystis* should be included in the Protothecaceae beside the achlorophyllaceous algae [*R.A.M.*, xv, p. 94].

Schilling (C.) & Santoni (D. A.) **Über Blastozystis.** [On blastocystis.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxvii, 5, pp. 293–298, 6 figs., 1936.

As a result of their studies on the blastocysts occurring as commensals in the rectum of the frog, the writers conclude that the process interpreted by Redaelli and Ciferri as sexual fusion is merely the final phase of division, and hence their proposed transference of *Blastocystis* to a section of the algae close to *Prototheca* [see preceding abstract] cannot be maintained.

Davis (B. H.). **The Cercospora leaf spot of Rose caused by Mycosphaerella rosicola.**—Abs. in *Phytopathology*, xxvii, 2, p. 137, 1937.

In the course of studies on the *Cercospora* leaf spot of roses at Ithaca, New York, an ascigerous stage was detected in overwintered leaves, and shown by mono-ascospore isolations and inoculations to be the perfect phase of *C. rosicola* [*R.A.M.*, xii, p. 612]. The fungus shares the generic characters of *Mycosphaerella* but does not agree with any of the described species, so a new combination [new species], *M. rosicola* (Pass.) is proposed [without a diagnosis]. The pathogenicity of the fungus (to *Rosa* spp. and varieties only) was confirmed by inoculation experiments.

Of the nine names applied to *C.* spp. on rose, only two were found on comparative study to be really distinct, viz., *C. rosae* (Fckl) von Höhn. [cf. *C. rosae* van Hook: ibid., ix, p. 37] unknown in the United States, and the ubiquitous *C. rosicola*. Among the specimens at the Cornell

University herbarium was a *Cercospora* from Savannah, Georgia, further material of which was secured from Florida. This species, differing from the two above-mentioned and occurring only in the southern States, is named *C. puderii* n. sp. [without a diagnosis].

McCulloch (Lucia). **An Iris leaf disease caused by Bacterium tardicrescens n. sp.**—Abs. in *Phytopathology*, xxvii, 2, p. 135, 1937.

Iris leaves are attacked by a yellow, Gram-negative, non-acid-fast bacterium with inconspicuous capsules, motile by a single polar flagellum and making slow and frequently erratic growth, to which the name *Bacterium tardicrescens* n. sp. is applied. The organism produced extensive, irregular, translucent, dark green (later yellow to brown) lesions but requires conditions of prolonged moisture for serious infection.

McWhorter (F. P.). **Didymellina poecilospora, n. sp., a semi-parasitic Heterosporium on bulbous Iris.**—Abs. in *Phytopathology*, xxvii, 2, pp. 135–136, 1937.

The overwintering leaves of bulbous iris in the Pacific Northwest are commonly discoloured by a *Didymellina* forming a conidial stage entirely distinct from *Heterosporium gracile* [*D. macrospora*: *R.A.M.*, xv, p. 99]. The species under observation forms abundant conidia only in freshly infected material, the blackening of the foliage being due to profuse perithecial development. The perithecia are identical with those of *D. iridis* [ibid., viii, p. 382] except in size, with ascospores averaging 25 by 6 μ. On the host the conidia are typically bicellular, measuring 12 to 38 by 6 to 9 μ; under humid conditions (natural or artificial) these organs proliferate and assume a *Cladosporium*-like habit. The name *D. poecilospora* n. sp. [without a diagnosis] is proposed for this relatively mild pathogen.

Calvino (Eva M.). **'Mal della rama' e 'mal del colletto' del Garofano.** [Stem and collar rots of Carnation.]—*Costa azzur. agric.-flor.*, xvii, 3, pp. 72–74, 1937.

Brief, popular notes are given on the symptoms and control of two carnation diseases found on the Italian Riviera, viz., stem rot caused by species of *Fusarium* (chiefly *F. dianthi*) [*R.A.M.*, xvi, p. 183] and collar rot due to *Rhizoctonia* [*Corticium*] *solani* [ibid., xi, p. 125; xv, p. 654]. Control of the former disease includes the use of resistant varieties, such as Fontmerle and Giovinezza. Carnations attacked by the latter fungus die within a few days. Infection chiefly occurs in May and June in the seed-beds or just after transplanting, but the disease is not common. Control consists in the removal of infected material and soil disinfection.

Calvino (Eva M.). **Septoria exotica, specie nuova per l'Italia.**—*Costa azzur. agric.-flor.*, xvii, 1, pp. 4–5, 1937.

In July, 1936, an entire planting of *Veronica bulkeana* in a garden in Italy suddenly wilted as a result of infection by *Septoria exotica*, not previously recorded from that country. Many of the leaves developed dry, brown spots and withered, the lesions subsequently turning white

in the centre and brown at the periphery; the white part, which measured 1 to 2 mm. in diameter, frequently fell out. The mature spores were uniseptate and measured 20 to 27 by 2 μ. Satisfactory control was given by the destruction of fallen leaves and spray applications with 1 per cent. Bordeaux mixture or 0·1 per cent. 'cerere' (tricresol-mercury acetate), the latter product being expected to be placed on sale in the spring of 1937. [An abstract of this paper appears in *Riv. Pat. veg.*, xxvii, 1–2, p. 23, 1937.]

Harrar (J. G.). **Cercospora leaf spot of Calendula.**—Abs. in *Phytopathology*, xxvii, 2, p. 130, 1937.

A leaf spot of *Calendula* spp. due to *Cercospora calendulae* Sacc. was first observed in Virginia in 1933 and increased in severity during the next two years. The fungus attacks plants of four weeks old and upwards, gaining ingress through the stomata. Infection progresses rapidly, frequently destroying the plants before flowering. The organism is conveyed through the air and soil, but apparently not by way of the seed. No evidence of resistance among 17 varieties was forthcoming. Monospore cultures of the fungus on several media yielded copious mycelial growth but no conidia. Control was effected by means of sulphur dust, lime-sulphur, Bordeaux, and copper oxide sprays.

P[ark] (M.). **A new disease of the Dahlia.**—*Trop. Agriculturist*, lxxxviii, 2, pp. 121–124, 1 pl., 1937.

In notes accompanying this reprint of G. H. Pethybridge's account of dahlia smut (*Entyloma dahliae*) [*R.A.M.*, viii, p. 244; xv, p. 370; xvi, p. 18] it is stated that the disease has recently been found in a garden in Kotmale, Ceylon. Under Ceylon conditions spray applications would be required throughout the year to ensure control if the disease once became established.

Meuli (L. J.). **Cladosporium leaf blotch of Peony.**—*Phytopathology*, xxvii, 2, pp. 172–182, 3 figs., 1937.

Cladosporium paeoniae, the agent of leaf blotch of peony [*R.A.M.*, viii, p. 293], produces dull chestnut-brown patches of irregular extent on the lower surfaces of peony leaves and a glossy, dark purple discoloration of the upper sides, and elongated, reddish-brown, later darkening, somewhat depressed streaks on the young green stems. Infection spots are abundant at branch and petiole bases, where diseased material may lodge and become a source of contamination or furnish a suitable environment for the establishment of the fungus. No hyphae were observed beneath the epidermal layers of the growing foliage, though in dead, infected leaves collected from the field the tissues were extensively invaded either by *C. paeoniae* itself or by secondary pathogens, including *C. herbarum*; the former is evidently at most only slightly parasitic.

C. paeoniae grew well on malt agar and other solid and liquid media, notably yeast-infusion glucose with 10 per cent. peony decoction. The round or lemon-shaped conidia constituting the bulk of the branching chains measure 6·4 by 3·7 μ, while the relatively few continuous or uniseptate, ellipsoid spores are 11·9 by 4 and 16·5 by 5·4 μ, respectively.

Positive results were given by the inoculation of healthy peony seedlings with a monoconidial suspension of the fungus which was consistently re-isolated from the infected tissues.

The first foliar infections were observed shortly before blossoming, the twigs and petioles being attacked several days later. The advance of the fungus was slow, and the vitality of the plants was not conspicuously impaired even by severe stem lesions. Conidia were formed in nature only under the unfavourable moisture conditions provided by late autumn and spring rains. In moist chambers profuse sporulation occurred at 70 and 90 per cent. humidity, whereas few conidia were formed in the presence of 50 per cent. moisture. The mycelium was found to overwinter in a dormant stage and produce conidia after more than a year. The conidia are disseminated chiefly by meteoric water but ants, commonly feeding on peony buds at the time of infection, probably assist in their conveyance from one part of the plant to another.

In a Madison nursery, the slender-leaved *Paeonia tenuiflora* remained entirely resistant to infection by *C. paeoniae*, which was particularly severe on the Oshkosh White, Felix Crousse, and Livingstone varieties, while sparing Gigantea and Humei Carnea. Promising results were given by burning the diseased foliage in the autumn and by the transference of clean roots to non-infested areas. Some degree of control was also obtained by the application to the leaves in the late spring of 3–2–50 Bordeaux mixture at the rate of 25 l. per acre.

Weber (Anna). **Sygdomme og skadedyr paa Chrysanthemum.** [Chrysanthemum diseases and pests.]—Reprinted from *Beretn. dansk. Chrysanthemum Selsk. Virksomh. 1936*, 11 pp., 9 figs., [? 1937].

Brief, popular notes, accompanied by a useful key, are given on the occurrence and control of chrysanthemum diseases and pests in Denmark, the former including *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, ix, p. 786], *Septoria chrysanthemella* [ibid., viii, p. 175], *Puccinia chrysanthemi* [ibid., xv, p. 583], *Oidium chrysanthemi* [or *Erysiphe cichoracearum*: ibid., vi, pp. 164, 298, 305; xv, p. 583], and *Botrytis* sp.

Oyler (Enid) & Bewley (W. F.). **A disease of cultivated Heaths caused by Phytophthora cinnamomi Rands.**—*Ann. appl. Biol.*, xxiv, 1, pp. 1–16, 2 pl., 1937.

This is a fully tabulated account of the authors' investigations, comprising a discussion of the morphology and taxonomy of the causal organism of the disease of the cultivated heaths (*Erica hiemalis*, *E. nivalis*, and *E. willmoreana*) due to *Phytophthora cinnamomi* in England, a somewhat condensed report of which has been noticed from another source [*R.A.M.*, xv, p. 655].

Schmidt (H.). **Eine noch zu wenig beachtete Krankheit der Cyklamen.** [An as yet too little heeded Cyclamen disease.]—*Blumen- u. Pfl Bau ver. Gartenwelt*, xli, 5, pp. 50–51, 1 fig., 1937.

A semi-popular note is given on the brown root rot of *Cyclamen* [*persicum*] caused by *Thielavia* [*Thielaviopsis*] *basicola* [*R.A.M.*, xv, p. 536], which is stated to be responsible for heavy damage in the

Pillnitz district of Saxony and elsewhere in Germany and resists the usual control measures. Soil sterilization appears to be the most promising of those tested but further experiments are necessary to determine the correct mode of application.

Nicolas (G.) & Aggéry (Berthe). **Une maladie bactérienne du Cyclamen de Perse.** [A bacterial disease of the Persian Cyclamen.] —*C.R. Soc. Biol., Paris*, cxxiv, 5, pp. 411–414, 1937.

Early in January, 1937, the writers' attention was drawn to a disease of two-year-old hothouse *Cyclamen persicum* plants at Toulouse, characterized by irregular, yellow, mostly marginal foliar lesions, surrounded by a greenish-yellow border. The petioles may also be involved and collapse, dragging the withered leaves down to the soil, where they rapidly become covered with *Botrytis*. The diseased foliage is abnormally thick and parchment-like. The numerous flowers attempted in 1936 had shrivelled before opening and remained attached to the tubercle by their short peduncles, while the few blossoms of the current season were also largely abortive. The symptoms were much more marked at a temperature of 18° to 20° C. than in the cooler houses.

In some respects the foregoing features recall those of the disease caused by *Gloeosporium cyclaminis* [*R.A.M.*, xv, p. 657], but there was no trace of this organism in the infected tissues of the leaves, petioles, flowers, and tubercles, which teemed, on the other hand, with coccoid bacteria, 0·6 μ in diameter, occurring in groups of two or three, staining vividly with gentian violet and methylene blue. Gram-negative, and forming dark cream-coloured, glistening colonies on agar. Longitudinal sections through the rootstock revealed the presence of pinkish-brown streaks extending from the top through the vascular bundles but not reaching the base; both the wood vessels and the adjacent parenchyma were occluded by viscous masses of bacteria. Positive results were obtained in inoculation tests on a healthy plant. Natural infection is believed to be effected by bacteria from the soil penetrating the leaves by way of the stomata on the under side and thence passing to the petiole, the rootstock, and finally to the roots, where they are, however, less abundant.

Curtis (J. T.). **Non-specificity of Orchid mycorrhizal fungi.**—*Proc. Soc. exp. Biol., N.Y.*, xxxvi, 1, pp. 43–44, 1937.

Of 33 isolations of *Rhizoctonia* made from native Wisconsin orchids [cf. *R.A.M.*, xv, p. 170], at least 16 are stated to be morphologically distinct. All the strains possess the typical 'spore forms' described by Bernard (*Ann. Sci. nat., Bot.*, ix, p. 1, 1909) for the *R.* species collected on tropical and European orchids; one also develops a perfect stage with basidia, but its exact taxonomic position has not yet been determined.

A correlation appears to exist rather between ecological habitat and fungus-type than between host species and fungus. For instance, *Habenaria leucophaea* from a tamarack [*Larix laricina*]-sphagnum bog was infected by a different strain of *R.* from that occurring on the same species in an open prairie, while conversely, four other orchids from the same bog, *H. dilatata*, *H. hyperborea*, *H. lacera*, and *Pogonia ophioglossoides*, harboured an *R.* strain morphologically identical with that

from *H. leucophaea*. In another case, three widely separated orchid species, *Goodyera pubescens*, *H. psycodes*, and *Liparis liliifolia*, growing in and on the sides of a rocky, pine-covered ravine, all bore the same fungus.

The extent of this non-specific infection is apparent from the number of distinct strains infecting the same orchid in various parts of the State. Thus, three *R.* strains were isolated from *Spiranthes cernua*, three from *P. ophioglossoides*, and four from *H. leucophaea*, while the last-named actually harboured two entirely different strains at opposite ends of the same root piece. Not only were morphologically distinct *R.* strains found in the same plant, but striking physiological differences were also observed.

These observations are at variance with the assumptions of Bernard and Burgeff [*R.A.M.*, xvi, p. 115] as to the indispensability of a specific mycorrhizal fungus to a given orchid, and suggest rather that the connexion is primarily determined by ecological factors.

Servazzi (O.). **Sulla biologia di Pestalotia macrotricha Kleb.** [On the biology of *Pestalozzia macrotricha* Kleb.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 5–6, pp. 72–92, 2 pl., 1936.

In this study on *Pestalozzia macrotricha* from *Kalmia latifolia* [*R.A.M.*, xiv, p. 608] in Italy the author states that the conidia on this host are somewhat atypical compared with those occurring on *Rhododendron*, on different species of which it is widely prevalent in that country. The atypical conidia differ from the typical in the number and length of the setae (2 or 3 against 2 to 4, usually 3, and 17 to 27 μ against 25 to 40 μ) and to some extent in colour. Conidia from natural infections of *K. latifolia*, when cultured in Raulin's medium, gave rise at first to atypical conidia, but in the fourth generation to typical conidia, showing that both forms belong to the same fungus which was able to adapt itself to various species of the Ericaceae-Rhododendreae. In culture the atypical form developed larger, darker, and longer conidia the less nutrient there was in the medium, and at certain concentrations of the nutrient pycnidia and pseudopycnidia were formed instead of acervuli.

Inoculations made with suspensions of typical conidia on young and adult *K. latifolia* and *Rhododendron maximum* leaves, without wounding, gave positive results (diffused infection) only when the inoculation site was at the leaf base. The experiments demonstrated that the fungus is a weak parasite. On young inoculated leaves of both hosts pycnidia and occasionally pseudopycnidia developed, while on adult inoculated leaves of both hosts acervuli (and occasionally pseudopycnidia) developed. Both typical and atypical conidia were found on the inoculated *K. latifolia* leaves, while on the *R. maximum* leaves typical conidia were found almost exclusively. A study of the enzymes liberated by the fungus showed the presence of lipase, saccharase, trehalase, emulsin, amylase, urease, allantoinase, and phenolase either as exo- or endo-enzymes.

Jones (D. J. C.). **Important fungoid diseases of grass turf.**—*Parks, Golf Courses & Spts Grnds*, ii, 5, pp. 128–129, 1937.

Brief notes are given on the symptoms and control of a number of

diseases of turf [in England]. Damping-off of young grass seedlings (*Cladochytrium graminis*) [? *C. caespitis*: *R.A.M.*, xiii, p. 520] occurs as small, yellow spots on the lawn which under favourable temperature and moisture conditions rapidly affect the whole surface, sometimes necessitating re-sowing. Mild attacks, however, have only a temporary effect, and spread may be checked by dry weather. *Agrostis* seedlings are readily susceptible to the fungus. The affected areas should be treated with Cheshunt compound (1 oz. per 2 galls.).

Snow mould (*Fusarium nivale*) [*Calonectria graminicola*: ibid., xv, pp. 74, 706] generally occurs under cold, moist conditions. It is favoured by acid soil, and turf treated with excessive amounts of sulphate of ammonia is liable to recurrent attacks.

The brown or bleached patches due to *Corticium fuciforme* [ibid., xv, pp. 702, 706] are less definitely outlined than those caused by *Calonectria graminicola* and the disease is less serious. As the fungus may remain dormant in the soil, infected turf should be treated at once with an organic mercury compound, Bordeaux mixture, or malachite green.

Brown patch (*Rhizoctonia* spp.) [chiefly *Corticium solani*: ibid., xv, pp. 702, 445, 706] is less prevalent in Great Britain than in America.

Dallas (W. K.). **Spray schedule for control of principal orchard diseases and pests.**—*N.Z. J. Agric.*, liv, 1, pp. 15–24, 1937.

Spray schedules with notes are given for a number of diseases of fruit trees in New Zealand, including apple black spot [scab] and powdery mildew [*Venturia inaequalis* and *Podosphaera leucotricha*: *R.A.M.*, xvi, p. 262], pear scab [*V. pirina*: ibid., xvi, p. 187], peach leaf curl [*Taphrina deformans*: see below, p. 473], and peach brown rot and rust [*Sclerotinia fruticola* and *Puccinia pruni-spinosae*: ibid., xvi, pp. 264, 368]; directions are also given on the treatment of *Stereum purpureum* and avoidance of apple russet (spray injury).

Harding (P. L.) & Powell (C. L.). **Transportation of Apples from the Shenandoah-Cumberland section to overseas markets.**—*Tech. Bull. U.S. Dep. Agric.* 523, 26 pp., 5 figs., 2 graphs, 1936.

Apples shipped under refrigeration from different parts of the Shenandoah-Cumberland fruit-growing section of Virginia, West Virginia, Maryland, and Pennsylvania via New York to England reached their destination practically free from decay and in the best condition, whereas fruit held in ordinary stowage showed varying amounts of rot, sometimes accompanied by internal breakdown [*R.A.M.*, xvi, p. 107]. For instance, Wealthy and Bonum apples travelling from Virginia to Liverpool under refrigeration in 1931 arrived in perfect condition, while the same varieties in ordinary stowage showed, respectively, 2 to 20 and 5 per cent. decay. Refrigerated Jonathan and King Davids also arrived at Liverpool free from decay, while corresponding lots in ordinary stowage showed from 2 to 5 per cent. rot. In another test Lowry, Delicious, and Jonathan apples from Maryland subjected to refrigeration on board ship arrived in good market condition in London, while the lots in ordinary stowage contained, respectively, 10 to 15, 2 to 6, and 1 per cent. decay and breakdown.

Refrigeration during rail transit from Virginia to Jersey City, New

Jersey, somewhat reduced the incidence of rot, especially in Grimes Golden, but did not significantly retard the rate of softening.

Holz (W.). **Einfluss des Lichtes auf die Perithezienbildung von Venturia inaequalis Aderhold.** [The influence of light on perithecial formation by *Venturia inaequalis* Aderhold.]—*Zbl. Bakt.*, Abt. 2, xcv, 21–26, pp. 469–471, 5 figs., 1937.

Perithecia of *Venturia inaequalis* on apple leaves [see next abstracts] kept in the dark assumed a variety of abnormal shapes; in some cases several necks were formed but the viability of the ascospores did not seem to be impaired. The admission of small amounts of light (20 minutes' daily illumination) promoted normal perithecial development, and even one weekly exposure of the same duration sufficed to induce the formation of organs differing from the characteristic type only in their profuse development of setae.

Jahresbericht der Preussischen landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe) Berichtsjahr 1. April 1935 bis 31. März 1936. [Annual Report of the Prussian Agricultural Experiment and Research Stations at Landsberg (Warthe) for the administrative year from 1st April, 1935 to 31st March, 1936.]—*Landw. Jb.*, lxxxiv, 1, pp. 95–125, 1 fig., 1 diag., 1937.

In the section of this report (pp. 95–102) dealing with the investigations of G. O. Appel and his collaborators at the Phytopathological Institute of the Landsberg Experiment Station [cf. *R.A.M.*, xv, p. 479], an account is given of a study by K. Küthe on physiologic specialization in apple scab (*Venturia inaequalis*) and on the critical period for the application of fungicidal sprays [ibid., xvi, p. 188]. In greenhouse inoculation experiments strain A 124 of the fungus, originating on the Edel variety, attacked only Edel in one test, Edel and Ananas Pippin in another, and finally infected all the varieties used in the trials. It is thus evident that the organism, while finding certain varieties more congenial than others, will attack a wide range under appropriate conditions. In experimental weekly sprayings with Bordeaux mixture on Golden Pearmain carried out on 18th and 25th April and 2nd May, the second was the most efficacious, resulting in a crop of 47·1 per cent. completely healthy fruit and only 0·2 per cent. severe scab, the corresponding figures for untreated being 6·1 and 1·7 per cent., respectively, for those sprayed on 18th April 21·6 and 0·5 per cent., and for those treated on 2nd May 4·5 and 5·8 per cent. The explanation of the absolute inutility of the third application lies in the fact that the ascospores had already been liberated, the discharge reaching its maximum intensity on 28th April. These data are considered to afford further confirmation of the decisive part played by the ascospores in primary infections by *V. inaequalis* [ibid., xv, p. 375], at any rate under local climatic conditions. Isolated cases of primary conidial infection have also been observed, but in general these organs serve merely for the perpetuation of the fungus on a given tree [see next abstract]. The lack of agreement between the reports of different workers with identical fungicides are also explained by discrepancies in the time of treatment.

GLOYER (W. O.). **Evaluation of the Geneva experiment on scab control.** —Abs. in *Phytopathology*, xxvii, 2, p. 129, 1937.

In the course of a seven-year investigation at Geneva (New York) on the value of lime-sulphur (1 in 40) in the control of apple scab [*Venturia inaequalis*: see preceding and next abstracts] and on the effects of the fungicide on certain physiological processes and disorders of the host [*R.A.M.*, xv, p. 727], overwintering conidia were observed to be of greater importance in the initiation of infection than is generally believed [see preceding abstract]. Dormant branches, forced and incubated in the greenhouse, bore conidia on the scale leaves. The spread of overwintering conidia is apparently favoured by heavy rain ($\frac{1}{2}$ in. or more) in the delayed-dormant stage. The disease was controlled by three applications when spraying operations commenced with either the delayed-dormant, pre-blossom, or calyx spray. The fungicide in the cover sprays prevented autumn infection of the lower leaf surfaces.

KEITT (G. W.) & PALMITER (D. H.). **Eradicant fungicides in relation to Apple scab control.**—Abs. in *Phytopathology*, xxvii, 2, p. 133, 1937.

In small-scale autumn spraying experiments [in Wisconsin], the application of certain copper-lime-arsenite preparations [*R.A.M.*, xiv, p. 381] to apple trees reduced the incidence of perithecia of *Venturia inaequalis* [see preceding abstracts] the following spring by 99 to 100 per cent. without seriously injuring the host. A spring application of a solution of ammonium sulphate (1 lb. per gall.) to overwintered leaves on the ground destroyed the mature ascospores of the fungus and arrested its further development. In an orchard, sprayed in the autumn of 1935 with copper-lime-arsenite mixtures, overwintered leaves averaged 5 perithecia per sq. in. compared with 255 in an untreated orchard 300 ft. distant. Neither orchard was sprayed in the summer of 1936. The following percentage reductions were determined by counts in the incidence of scab lesions in the autumn-sprayed orchard: Wealthy leaves, 2nd June 99, 6th July 87; Northwestern Greening leaves, 4th June 94, 9th July 85; Wealthy fruit, 10th July 87, 2nd September 75. On 2nd September, there was 55 per cent. diseased Wealthy fruit in the sprayed orchard compared with 99 per cent. in the untreated.

CARNE (W. M.) & MARTIN (D.). **Preliminary experiments in Tasmania on the relation of internal cork of Apples and cork of Pears to boron deficiency.**—*J. Coun. sci. industr. Res. Aust.*, x, 1, pp. 47–56, 1 fig., 1937.

The exchange of affected apples between Tasmania and New Zealand showed that corky pit in the latter country is symptomatically the same in the same varieties as internal cork in Tasmania [cf. *R.A.M.*, xvi, p. 388]. The same disorder has been variously known as internal cork in Australia, corky pit in New Zealand, cork in the United States, and from the superficial lesions as drought spot in the United States and Canada. Corky core is a specialized form of internal cork affecting only the core and found typically in Jonathan apples. Typical drought spot has not been recorded in Australia.

The reduction of growth and the failure of leading stems to maintain their upward growth, malformed shortened shoots, and the death of

shoots have been associated under the name 'die-back' with internal cork, and are probably partly due to the same cause.

In Tasmania internal cork affects Sturmer and Granny Smith, which frequently show fruit malformation, while in Pomme de Neige, Duke of Clarence, and Jonathan, fruit malformation is less usual; French Crab, Delicious, Dunns, and Cleopatra are less susceptible, but show malformation or dimpling of the fruit, without internal lesions; Crofton and Democrat are nearly or quite resistant.

In preliminary trials soil dressings of 3 lb. boric acid per tree completely controlled internal cork of apples, but caused some injury on light soils and to small trees. Injections of 1 to 2 l. of 0·25 per cent. boric acid solution were completely effective in all parts of the tree when made in one fork of the trunk; slight leaf injury was caused in the branches immediately above the injection. The insertion of 0·5 or 1 gm. boric acid (either loose or in a gelatine capsule) in a $\frac{1}{2}$ in. auger hole in a main branch or the trunk affected only the branches immediately connected with the hole.

The dimpling of Cleopatra apples and cork in pears [ibid., xii, p. 769] did not respond to the treatments, and it is thought that the causes of these troubles may be different from those of internal cork in apples.

Burrell (A. B.) & Miller (H. J.). **Boric acid treatment of a physiogenic Apple disease.**—Abs. in *Phytopathology*, xxvii, 2, p. 123, 1937.

Immediately after petal fall, 0·75 to 2 gm. boric acid crystals were injected through a single hole, $\frac{7}{16}$ m. in diameter, in the crown of each of 12 young McIntosh and Fameuse apple trees affected [in the Lake Champlain Valley, on the New York–Vermont boundary] by a complex disorder manifested by symptoms of drought spot, cork, rosette [stated by the first-named author in an accompanying paper to be distinct from the zinc-responsive rosette of the western United States: *R.A.M.*, xvi, p. 259], and die-back [ibid., xii, p. 769 and preceding abstract]. At the time of treatment, these trees had 1,335 rosette twigs, of which 92·4 per cent. resumed normal growth within six weeks, the corresponding figures for 7 trees with 866 diseased twigs receiving zinc sulphate flakes, and for 6 controls with 769 affected twigs being only 2 and 1·4 per cent., respectively. On 10th August, incipient die-back was observed on 1·1 twigs per boric acid-treated tree, 60·4 of those given zinc sulphate, and 65·5 of the controls, the corresponding figures for abnormal second growth being 2·2, 23·3, and 20·2 per cent., respectively. Dry boric acid caused appreciable injury round the site of injection but no damage to the leaves, while zinc sulphate adversely affected both parts. The introduction of boric acid into mature trees gave promising but inconclusive results. The injection of 5 per cent. boric acid solution was highly detrimental, whereas at 1 per cent. the treatment was usually well tolerated.

Johnson (J. C.) & DeLong (W. A.). **Boron content of Apples at different stages of development.**—*Plant Physiol.*, xii, 1, pp. 219–220, 1937.

The results of periodical tests during the 1934 growing season, made on healthy apple fruits of the Golden Russet variety in Nova Scotia,

showed that in this fruit the boron content progressively increased throughout the season, the increase being relatively very rapid during the period of cell division and rapid growth (June), after which the rate of accumulation of this element slowed down considerably but persisted up to the normal harvest time. The boron : dry weight ratio, however, decreased fairly rapidly during June and July, after which it remained practically constant. These observations are considered to emphasize the apparent importance of boron during the period of rapid growth of the apples.

MOREAU & VINET. **Carpocapse et tavelure. Dates des traitements des arbres fruitiers dans le Val de Loire.** [*Carpocapsa* and scab. Dates for treatments of fruit trees in the Val de Loire.]—*C.R. Acad. Agric. Fr.*, xxiii, 6, pp. 190–195, 1937.

William pears should be treated against scab [*Venturia pirina*] in the Val de Loire with 1 per cent. Bordeaux mixture, the first application being made before the opening of the floral buds (8th April in 1935, 26th March in 1936), the second at petal fall (24th and 17th April, respectively), and the third three weeks to a month later (about 15th May) [*R.A.M.*, xv, p. 735]. Where scab and *Carpocapsa* [*Cydia pomonella*] are to be jointly combated, the Bordeaux mixture should be supplemented by lead arsenate (0·5 to 1 kg. per hectol.). An omission of the first treatment may lead to a serious reduction in the efficacy of the treatment.

HERBST (W.). **Venturia pirina Aderhold. II. Die Abhängigkeit der Formenverbreitung von meteorologischen Faktoren.** [*Venturia pirina* Aderhold. II. The dependence of form distribution on meteorological factors.]—*Gartenbauwiss.*, xi, 1, pp. 35–53, 5 figs., 2 diags., 1 graph, 1 map, 1937.

The existence of polymorphism in the agent of pear scab (*Venturia pirina*) having been demonstrated by previous studies [*R.A.M.*, xvi, p. 45], an attempt was made to solve the problem of the variations in the 'population' composition of a number of German collections of the fungus, over 3,000 monospore cultures of which were examined, taking the Geisenheim 'population' as a criterion. Actual linear distance from Geisenheim was found to be only a subsidiary factor in the discrepancies between the constitutions of the various local collections, meteorological influences, especially the direction of the prevailing winds (north-east and south-east in the Geisenheim district), playing a decisive part in the distribution of the various forms. The course of a cyclone affords a graphic illustration of the method of spore distribution, the deep depression in its van creating the necessary conditions for the ejection of the ascospores, which are then disseminated primarily by the north-westerly side currents in its wake. A south-easterly spore drift may thus in general be expected to provide the maximum influx of inoculum, a statement that must naturally be modified by a consideration of local topographical factors, such as the protection from spore invasion afforded by mountains, forests, and the like. In this connexion more intensive studies of bioclimatic factors are urged in relation especially to the epidemiological branch of plant protection. It is thought to be

probable that many other wind-distributed parasites are governed by similar laws to those operating in the case of *V. pirina*.

HILDEBRAND (E. M.) & HSIONG (S. L.). **Inheritance of plant characters and resistance to fireblight in Pear.**—Abs. in *Phytopathology*, xxvii, 2, p. 131, 1937.

In the hope of finding a basis for the breeding of pears resistant to fireblight [*Erwinia amylovora*: *R.A.M.*, xvi, p. 391], the writers examined the reciprocal crosses between a number of standard varieties at the New York (Geneva) Experiment Station. The transmission to the progeny of certain plant characters, e.g., leaf size and serration, fruit quality, and stem thickness, was found to be correlated in the relatively resistant varieties, Kieffer and Seckel, with the heritability of blight resistance, as gauged by the percentage of positive inoculations and the length of lesion produced.

IVANOFF (S. S.) & KEITT (G. W.). **Aerial bacterial strands in fireblight.**—Abs. in *Phytopathology*, xxvii, 2, p. 132, 1937.

Hair-like, curved, usually colourless, glistening aerial strands, composed of cells of *Erwinia amylovora* [see preceding abstract and below, p. 482] and measuring a fraction of a millimetre to several centimetres by 8 to 45 μ were observed on pear blossoms, young fruits, and shoots inoculated with the pathogen and were subsequently produced experimentally under greenhouse and field conditions [in Wisconsin] in the spring of 1936. They disintegrate immediately in water and slowly in glycerine, releasing large numbers of viable and infectious bacteria. These strands appear to represent a special form of the well-known bacterial exudate, their component materials originating in the internal diseased tissues and emerging at the surface through minute apertures. They are easily broken off and disseminated by wind.

DIPPENAAR (B. J.). **Cause and control of heat spot of Plums.**—*Fmg S. Afr.*, xii, 131, pp. 83–85, 1937.

Continuing his studies on the etiology and control of 'Kelsey' (better designated 'heat') spot of plums in Cape Province [*R.A.M.*, xv, p. 34], the writer confirmed previous observations as to the causation of the disturbance by excessively high internal fruit temperatures (74·7° to 120·7° F.) on abnormally hot days in the orchard. The best control of the condition was obtained by the application to the soil round the trees of a fertilizer mixture of superphosphate, potash, and nitrogen, the costs of which, however, are regarded as unjustifiably heavy for the object in view.

ZELLER (S. M.). **Controlling Peach leaf curl.**—*Bett. Fruit*, xxxi, 7, pp. 16–17, 1 fig., 1937.

The most prevalent and destructive disease of peaches in the humid sections of the Pacific Northwest and probably wherever the peach is grown in this locality is leaf curl (*Taphrina deformans*) [*R.A.M.*, xv, p. 234; xvi, pp. 389, 393]. In equally susceptible varieties of peaches, differences in earliness may influence severity of attack. The Elberta peach, some of the Clings, Columbia, Crawfords, and Muir are susceptible

in a diminishing scale in this order. In Oregon the disease if uncontrolled will ruin an entire orchard in two or three years. Thorough spraying with Bordeaux mixture (6–6–50) should be carried out not later than December. The addition of sugar (1 oz. per 100 galls. of spray) will prevent deterioration of the spray for a few weeks.

Sherbakoff (C. D.) & Andes (J. O.). **Peach diseases and their control in Tennessee.**—*Bull. Tenn. agric. Exp. Sta.* 157, 11 pp., 1936. [Received April, 1937.]

Brief, popular notes are given on the symptoms and control of the more important peach diseases and insect pests in Tennessee, including brown rot [*Sclerotinia fructicola*: *R.A.M.*, xvi, p. 264], leaf curl [*Taphrina deformans*: see preceding abstract], scab [*Cladosporium carpophilum*: ibid., xv, p. 235], and bacterial leaf spot [*Bacterium pruni*: loc. cit.]. A dormant spray (lime-sulphur 1–7, Bordeaux mixture 2–4–50 with 3 or 4 per cent. oil, or creosote oil 2 per cent. with 3 per cent. oil emulsion) is always necessary for leaf curl and scale insect control. Four summer sprays are recommended (at the 'shuck' stage for insects only, a fortnight later, June, and July, respectively), with a petal-fall sulphur spray in addition if blossom infection by *S. fructicola* is expected, and one or more pre-harvest applications of sulphur after July if conditions favour brown rot of the fruit. Sulphur sprays should be applied early against scab and wettable or flotation sulphur may be used in place of dry-mix. The use of a combination consisting of 4 lb. zinc sulphate and 4 lb. hydrated lime per 50 galls. water, with lead arsenate, decreases the injurious effects of the lead arsenate and defoliation due to bacteria.

Rose (D. H.), Fisher (D. F.), Brooks (C.), & Bratley (C. O.). **Market diseases of fruits and vegetables: Peaches, Plums, Cherries, and other stone fruits.**—*Misc. Publ. U.S. Dep. Agric.* 228, 27 pp., 11 pl. (6 col.), 1937.

This publication is a revised, elaborated version of a handbook issued in 1919 for the use of food-products inspectors. Notes are given on the occurrence, symptoms, effects, and control of the following fungal rots of stone fruits besides various types of injury, viz., green mould rot of cherries (*Alternaria* sp.) [*R.A.M.*, iv, p. 176], bacterial rot (*Bacterium pruni*), black mould rot of peaches and cherries (*Aspergillus niger*), blue mould rot (*Penicillium* sp.) and brown rot (*Sclerotinia fructicola*), California blight (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: ibid., xvi, p. 393], green mould rot of sweet cherries, peaches, and plums, due to a *Cladosporium* other than that causing scab of stone fruits [*C. carpophilum*], grey mould rot (*Botrytis* ? *cinerea*), powdery mildew (*Sphaerotheca pannosa* var. *persicae*) on peaches [ibid., vi, p. 123] and nectarines, *Rhizopus* rot (*R. nigricans* and possibly other species), and leaf curl (*Exoascus* [*Taphrina*] *deformans*) of peaches [see preceding abstracts] and nectarines occasionally found affecting market fruit, rust (*Tranzschelia* [*Puccinia*] *pruni-spinosae*) [ibid., xvi, p. 468], and scab (*C. carpophilum*) besides internal browning of peaches (not in cold storage) resembling cork in apples, and various injuries.

Rietsema (I.). **De mosaiekziekte der Frambozen.** [The mosaic disease of Raspberries.]—*Fruitteelt*, xxvi, 12, pp. 206–212, 1936.

Following a general discussion on varietal reaction to raspberry mosaic in Holland [*R.A.M.*, xii, p. 705], the writer gives a brief account of his experiments in the development of resistant strains by hybridization. Excellent results were obtained by crossing a strain of the susceptible Haagsche Bruin variety with one of the selfed family 112 and plans have been made for the multiplication of the progeny.

Plakidas (A. G.). **The rosette disease of Blackberries and Dewberries.** —*J. agric. Res.*, liv, 4, pp. 275–303, 8 figs., 1 graph, 1937.

A full account is given of the author's studies of the rosette disease of blackberries and dewberries (*Rubus* spp.) [*R.A.M.*, xiii, p. 786], which is stated to occur, so far as known, only in the southern and south-eastern parts of the United States, from New Jersey to south-east Texas, and from southern Illinois to the Gulf of Mexico. The causal fungus, originally named *Fusisporium rubi* by Winter and transferred to *Ramularia* as *R. rubi* by Wollenweber, is renamed *Cercosporella rubi* (Winter) comb. n. with a revised technical description. In cultural studies the organism was shown to grow readily on a variety of media, on which it sporulates fairly well; the spores are variable in size, shape, and number of septa. The minimum, maximum, and optimum temperatures for growth in culture were found to be 6°, 30°, and 25° C., respectively. In nature, the mycelium occurs within the vegetative and flower buds of the host, but only sporulates in the spring on the open flowers. Usually the canes newly produced (primocanes) do not show external symptoms of the disease, but the following spring the infected buds form the rosette or witches' broom type of growth. While histological studies did not reveal tissue invasion by the fungus, the latter was found in close association with the embryonic bud elements, from which it is believed to derive its nourishment and thus to starve the infected buds. In infected pistils, the fungus prevents the fusion of the carpellary walls, and the stylar canal, thus left open at the base of the style, is filled with hyphal strands, which also occur inside the ovule. Experimental evidence indicated that infection may, under certain conditions, become systematic in the crowns of dewberry plants arising from tip rootings of rosetted canes, but not in the blackberry.

The pathogenicity of *C. rubi* to wild and cultivated species of blackberries and dewberries was demonstrated in repeated experiments extending from 1931 to 1934. There was evidence that in Louisiana natural infection does not usually occur after the last week in May or the first week in June, temperature being believed to be the limiting factor. The fact, however, that on the Nanticoke blackberry infection also occurs as late as in July, suggests that other factors besides temperature may have a determining influence on the time of infection.

Saunderson (W. R.) & Cairns (H.). **On the control of Gooseberry rust.**—*Ann. appl. Biol.*, xxiv, 1, pp. 17–25, 1 pl., 1 graph, 1937.

The authors state that observations in Northern Ireland, from 1933 to 1935, inclusive, on over twenty varieties of gooseberry, representing

the three types of the fruit (red, green, and yellow), did not reveal any pronounced variation in their susceptibility to rust (*Puccinia pringsheimiana*) [*R.A.M.*, xiii, p. 173]. Details are then given of experiments from 1932 to 1934, inclusive, the results of which showed that effective control of the rust was afforded by spraying the bushes with Bordeaux mixture at concentrations of 2 (2–1·5–10), 1, and 0·5 per cent., or with a proprietary colloidal copper preparation containing 15 per cent. metallic copper, or lastly, with another proprietary colloidal sulphur preparation with 15 per cent. sulphur, the two last-named preparations being applied at 0·5 per cent. concentration. Burgundy mixture caused some defoliation and is not recommended. The tests also indicated that repeated spraying does not appreciably increase the efficacy of the treatment, provided the first application is made at the optimum time, which was found to be about two weeks after the gooseberry begins to flower. There was evidence that this moment coincides with the maximum discharge of the basidiospores of *P. pringsheimiana*, which commences with or soon after the beginning of seasonal growth of the gooseberry, and normally terminates some four or five weeks after flowering. While no attempt was made to correlate the aecidial stage of the rust on the gooseberry with sedge rust, it was noted that in the vicinity of the experimental centre at Galgorm, *Puccinia* sp. was present on four species of *Carex*, namely, *C. goodenowii*, *C. inflata*, *C. flava*, and *C. panicea*.

Stahel (G.). **The Banana leaf speckle in Surinam caused by Chloridium musae nov. spec. and another related Banana disease.**—*Trop. Agriculture, Trin.*, xiv, 2, pp. 42–45, 4 pl., 1937.

Congo bananas growing under shade trees and along the humid edges of the jungle in Surinam are affected by a leaf speckle [cf. *R.A.M.*, xiii, p. 455; xiv, p. 427] caused by a new species of *Chloridium* which is named [without a Latin diagnosis] *C. musae* n. sp. Every leaf up to the second may develop speckled patches which enlarge and may cover nearly the whole surface, considerably reducing the effectiveness of the infected leaves. The patches are formed by numerous isolated, minute, black or brown speckles in an otherwise green part, each corresponding with an air space. In the small spots on young leaves 5 to 10 per cent. of the chambers are blackened, while in the larger areas on the oldest leaves 60 per cent. are thus affected. The specks are visible on both sides of the leaves, but are more conspicuous on the upper. The vascular bundles continue to function, the damage done being confined to the assimilating tissue.

On the under surfaces of the leaves were found dark brown conidiophores 100 to 300 μ long, 2 μ thick at the base, and about $1\frac{1}{2}$ μ thick near the tip. The terminal part was hyaline, 20 to 30 μ long, and covered with minute projections bearing hyaline, oval or ovate conidia measuring 5 to 8 by 2 to $3\frac{1}{2}$ μ, with a minute papilla at the point of attachment. Many of the conidia germinated in water in 12 hours, producing a hyaline appressorium.

The fungus grew well in culture on acid nutrient agar, forming a dark olive-green mycelium with fairly typical conidiophores and abundant normal conidia. On banana agar the mycelium formed pointed, erect, rigid rhizomorphs 4 to 6 mm. long and covered with typical

conidiophores. Conidiophores were often formed at the ends of hyphae which also produced acrogenous solitary conidia on short side branches.

Effective control resulted from regular applications of Bordeaux mixture.

Another leaf speckle found so far only on Pisang Radja bananas on sandy soil in Paramaribo is caused by a fungus named *Ramichloridium musae* n.g., n. sp. [without Latin diagnoses]. Except on the oldest leaves, on the upper side of which they appear as light green spots, the spots are visible on the under surface only, on which they form velvety, greyish to brownish mats. The conidiophores measure 200 to 500 μ long, about 3 μ thick at the base, and 2 μ near the tip and bear short branches, placed opposite or singly. The conidia are produced in the same manner as those of *C. musae*, and are of the same length, but measure only $1\frac{1}{2}$ to $2\frac{1}{2}$ μ in width.

Heuberger (J. W.) & Adams (J. F.). **Another role of zinc-lime in combination Peach sprays.**—*Trans. Peninsula hort. Soc.*, xxvi, 5, pp. 55–59, 2 figs., 1 graph, 1936. [Received April, 1937.]

Laboratory tests of the adherence and fungicidal toxicity (against *Venturia inaequalis*) [see above, p. 440] of wettable sulphurs and the wettable sulphur-lead arsenate-lime-zinc sulphate combination sprays [used against *Bacterium pruni* on peach in Delaware: cf. *R.A.M.*, xiv, p. 682] showed that the former did not adhere sufficiently while the latter were more toxic and adherent, the hydrated lime reacting with both the acid lead arsenate and the zinc sulphate to produce a heavy precipitate giving increased adherence. The flocculation of acid lead arsenate-hydrated lime in the presence of a wettable sulphur destroys the dispersion, and the sulphur particles are carried down with the flocculent precipitate, resulting in greater adhesion and toxicity per unit area of spray film.

Heuberger (J. W.) & Adams (J. F.). **The influence of lead arsenate and lime on the fungicidal toxicity and adherence of wettable sulphur sprays.**—*Trans. Peninsula hort. Soc.*, xxvi, 5, pp. 68–72, 2 figs., 1 graph, 1936. [Received April, 1937.]

Laboratory tests of the fungicidal toxicity and adherence of various commercial brands of wettable sulphur alone and in combination with acid lead arsenate and hydrated lime [see preceding abstract], as tested against *Venturia inaequalis*, showed that no germination occurred on the combination spray films on the test slides after one washing, while germination on the wettable sulphurs averaged 35·4 per cent., the corresponding figures after two washings being 0 and 63·5 per cent., respectively.

Davies (F. A.) & Adams (J. F.). **The influence of spreaders and stickers in relation to the fungicidal efficiency of insoluble copper spray films.**—*Trans. Peninsula hort. Soc.*, xxvi, 5, pp. 32–39, 2 graphs, 1936. [Received April, 1937.]

Laboratory tests of the germinations of spore suspensions of *Macrosporium* [*Alternaria*] *solani*, *Glomerella cingulata*, and *Venturia inaequalis* on sprayed slides showed that inert spreaders such as bentonite and kaolin had no effect on the fungicidal efficiency of the insoluble copper sprays, coposil [*R.A.M.*, xv, p. 706] and Z–O. However, when

wyojel [ibid., xvi, p. 197] was used instead, the efficiency of both sprays was reduced as a result of chemical interference set up by the magnesium oxide in the spreader. This interference was obviated by the addition to the spray of acid lead arsenate at the rate of 3 lb. per 100 galls. Adherence, as gauged by fungicidal activity after repeated washing, was greatest when wyojel was used, but the difference from kaolin or bentonite was so slight that only under certain conditions would it make up for the reduced fungicidal efficiency involved.

Handbuch der Pflanzenkrankheiten. Sechster Band. Pflanzenschutz. Verhütung und Bekämpfung der Pflanzenkrankheiten. [Handbook of plant diseases. Volume VI. Plant protection. Prevention and control of plant diseases.]—Lieferung 1, pp. 1–288, 3 graphs, Berlin, P. Parey, 1937. Price RM. 16.20.

In this, the first part of a volume to be published in four parts in continuation of the sixth revised edition of Sorauer's 'Handbook of Plant Diseases', issued under the general supervision of Dr. O. Appel [*R.A.M.*, xiii, p. 646], fully documented surveys of the available information brought up to date (1936) are contributed on two outstanding aspects of plant protection. In the first section H. Morstatt discusses its economic importance and in the second section the functions of plant protection are reviewed at some length, the latter being treated under the following headings: the prevention of the occurrence of plant diseases and pests by a rational system of hygiene based on improved cultural methods (H. Braun); disinfection practices, comprising soil sterilization (H. Thiem), cereal and other seed treatment (E. Riehm), and quarantine regulations (H. Braun). The issue concludes with an incompleted section by W. Trappmann on physical methods of control.

Riehm (E.). **Pflanzenschutzmittelindustrie und Vierjahresplan.** [The plant protective industry and the four-year plan.]—*Angew. Chem.*, l, 9, pp. 173–175, 1937.

In connexion with the campaign, initiated in 1935, to render Germany self-supporting within the next four years, the writer defines the two principal tasks of the plant-protective industry as (1) the replacement of foreign raw materials by indigenous substances of like efficacy, and (2) the development of effective means of control of diseases that have hitherto proved refractory to treatment.

Foreign raw materials are at present very widely used in plant protection. For example, mercury is practically indispensable in the treatment of seed-borne cereal diseases, only one (formaldehyde) of the 13 official standard preparations for the purpose [*R.A.M.*, xvi, p. 24] being free from this substance. Formaldehyde, however, is recommended only against one disease, loose smut of oats [*Ustilago avenae*], whereas the mercury preparations are of much wider application, an essential factor in large agricultural concerns such as the co-operative seed disinfection stations [loc. cit.], of which there are stated to be 233 in Westphalia, 185 in Schleswig-Holstein, and 348 in Hanover. At a conservative estimate, the annual German requirements of mercurial dusts and liquid fungicides amount to 800 and 180 tons, respectively, so that it is incumbent on manufacturers to devise formulas in which the present

maximum mercury contents of dusts and liquids are reduced from 9 and 17 to 1 and 3 per cent., respectively.

It is also urgently necessary to reduce the annual outlay on copper (7,000 to 10,000 tons copper sulphate in the vineyards and 8,000 in the orchards); this element is essential for the control of downy mildew of the vine [*Plasmopara viticola*] and of hops [*Pseudoperonospora humuli*], but is to some extent replaceable against scab [*Venturia* spp.] in the orchard by sulphur, which is obtainable in abundance in Germany. Copper sulphate will also probably continue to be necessary for the control of reclamation disease [ibid., xv, p. 145], and so far no substitute has been devised for borax, of which some 1,000 tons were applied against heart and dry rot of beets in 1936.

HANSEN (K.). **Enkelt- og Nyhedsprøver. I. Motor-Frugttræsprøjten 'Ginge'.** [Individual tests of new appliances. I. Motor fruit tree sprayer 'Ginge'.]—*Beretn. Redskabsprøv., Kbh.*, 77, pp. 1–7, 1937.

Technical details are given of the construction, mode of operation, and application of a motor orchard sprayer, 'Ginge' (H. Nielsen & Co., P. Bangsvej 34, Copenhagen), weighing 250 kg. and costing Kr. 1,200 [£66. 5. 0. at par]. The apparatus gave satisfaction in the tests to which it was submitted, and may be recommended on grounds both of efficiency and economy. One or two suggestions are made for the improvement of various accessory parts.

HARTLEY (C.) & RATHBUN-GRAVATT (ANNIE). **Some effects of plant diseases on variability of yields.**—*Phytopathology*, xxvii, 2, pp. 159–171, 3 graphs, 1937.

While the principles of phytopathology have been consistently and successfully applied to improving the quantity and quality of plant products and decreasing the cost of production, less attention has been paid to another of its functions—that of reducing the erratic annual variations of yields, which are liable to cause widespread economic complications.

Two groups of diseases differing markedly in their effects of yield variation may be distinguished, one including those promoted by conditions weakening the host, which tend strongly to enhance the annual yield variations, and the other comprising disorders favoured by factors that simultaneously stimulate host growth. Representatives of the former group are probably most numerous among the root rots and vascular diseases, e.g., *Fusarium* wilt of cotton [*F. vasinfectum*], while a striking example of the latter is furnished by late blight of potatoes [*Phytophthora infestans*], which has been reduced from a source of disastrously heavy losses to an apparently stabilizing factor, as far as regional and national (not necessarily individual) yields are concerned, by the application of standard schedules of control.

Diseases of the foregoing types are amenable to analysis by the customary statistical methods, but there are others involving the unpredictable movements of insect vectors, such as curly top of sugar beets, that depart too widely from the normal course for their effects to be adequately expressed by these means.

Some concrete illustrations are cited of the combined effects on yield

variability of two or more diseases and of disease uncertainties affecting the individual producer.

Snell (W. H.). **Three thousand mycological terms.**—*R.I. bot. Club Publ.* 2, 151 pp., 12 pl., 1936. [Received March, 1937.] Price $2.

This glossary of over 3,000 mycological terms includes the technical terms generally used in college courses on the morphology of the fungi and on mycology. It also defines the special meanings of terms used to describe the Agarics, Boletes, and Polypores. Its usefulness is enhanced by twelve plates of sketches by H. A. C. Jackson.

Gram (E.) & Weber (Anna). **Bekæmpelse af Haveplanternes Sygdomme.** [Control of diseases of horticultural plants.]—Alm. Dansk Gartnerforening (S. L. Møllers Bogtrykkeri, Copenhagen), 184 pp., 86 figs., 1 diag., 1937.

This is the ninth enlarged and revised edition of a handbook, first published in 1910, which contains in a compact and readily intelligible form much useful information on the symptoms, causes, and control of the principal insect pests and diseases of horticultural plants in Denmark. An annotated list of plant protectives is appended.

Zesde International Botanisch Congres, Amsterdam, 2–7 September, 1935. [Sixth International Botanical Congress, Amsterdam, 2–7 September, 1935.] Proceedings. I. Report of Activities.—xvi+450 pp., 2 pl., 11 figs., 1936; II. Abstracts of sectional papers.—xiii+317 pp., Leyden, E. J. Brill, 1935.

Among the papers recorded in the second volume of the proceedings of the sixth International Botanical Congress may be mentioned the following: Langeron and Guerra (p. 165) stated that, in their study of the classification of the anascosporous yeast-like fungi, experiments on nearly 2,000 cultures confirmed the principles established by Mme Stelling-Dekker [*R.A.M.*, xvi, p. 412] and allowed them to separate 17 species belonging to Langeron and Talice's 6 genera [ibid., xi, p. 476] into 6 biological groups according to their ability or inability to ferment sugars. It is concluded that the classification of the anascosporous yeast-like fungi, particularly the Mycotoruleae, is based on morphological and biological characters for the genera and species, respectively.

J. Johnson (p. 193) suggested that the present confusion in the nomenclature of plant viruses could be remedied by using a technical name for each virus consisting of the common name of the host on which the virus was first found followed by the term 'virus' and a number corresponding approximately to the chronological order in which the virus is described on the host in question. Alphabetical letters after the number would indicate different strains and degrees of attenuation.

Further studies by H. M. Quanjer (p. 199) confirmed the validity of the classification of potato viroses proposed in 1931 [ibid., x, p. 746]. Interveinal mosaic, identical with Murphy's simple mosaic, is now placed in section 3, 'acronecrosis'. Mild and intermediate mosaic go in section 4 as 'acropetal necrosis', and are closely related to, if not identical with, Murphy's A virus. Only aucuba mosaic remains in

section 1. The Albion potato shows the net-necrosis (section 2) symptoms of leaf roll. Acronecrosis may be a complex of viruses belonging to section 3. Several viruses produce acropetal necrosis in some varieties; the virus of stipple streak differs from Smith's Y virus, and causes on the Bravo variety symptoms of rugose mosaic. Complex viroses of the crinkle type develop only when a virus in section 3 is combined with one in section 4. Pseudo-net necrosis (section 5) can be transmitted by stem-grafting and leaf inoculation. More than one virus may cause the condition, and produce different symptoms in different varieties. A tuber-transmissible virosis belonging to section 6 (concentric necrosis) has been found.

T. G. Tutin (p. 203) stated that all *Zostera* marina plants examined in British waters were infected with *Ophiobolus halimus* [ibid., xvi, p. 113].

G[erada] Wilbrink (p. 204) listed a number of definitions of immunological terms agreed upon by the phytopathological section of the Netherlands Botanical Society.

J. C. Walker (p. 206) discussed the nature of resistance as indicated by typical examples of morphological resistance, resistance due to substances present in the host and toxic to the fungus, protoplasmic resistance, and heritable, physiologic *Fusarium* resistance.

Săvulescu and Rayss (p. 208) described a method used in estimating the 'total parasitic effect' of an epidemic of *Nigrospora oryzae* on maize [ibid., xiii, p. 762], which may prove of service in other connexions. The product of frequency in the field and intensity on the plant, each expressed on a scale of 0 to 4, is found for as many fields as possible and the total divided by the number of fields, giving a maximum 'index of parasitic effect' of 16. In 8 pure lines each grown in 11 localities the figure ranged from 0·73 for Cincantin maize to 6·9 for Dinte de cal Pietrosani.

Böning (p. 210) discussed the influence of mineral salts on susceptibility [cf. ibid., xv, pp. 275, 420, *et passim*] and points out that not only a relationship exists between phosphorus +, nitrogen —, potassium + (group inducing resistance) and potassium —, nitrogen +, and phosphorus — (susceptibility group), but also between potassium —, phosphorus +, nitrogen —, and nitrogen +, phosphorus —, and potassium +, and the like.

Discussing so-called plant vaccination [ibid., xv, pp. 674, et seq.] D. Carbone (p. 212) pointed out that the available evidence does not support the hypothesis that vaccinated plants owe their resistance to the antimicrobic effect of the vaccines, to root mutilation or radical absorption of poisons [ibid., xv, p. 389] or to increased turgor [ibid., xiv, p. 386]. Some unknown factor does however, participate, the defensive reaction in vaccinated plants being accelerated, as compared with the controls [ibid., xiii, p. 795].

Delia Johnson (p. 221) obtained 41 cultures of bacteria which destroyed the sporidia of *Ustilago zeae*. Inoculations of young maize plants with water suspensions of each of 12 of these combined with water suspensions of the sporidia of the fungus gave only a few small galls in most cases, though inoculations with the sporidia alone gave normal galls. Inoculations of young galls with suspensions of the

bacterial cultures caused them to break down. The same type of bacteria was found in smut balls from other cereals, and faeces of maize-fed cattle, but not in soils except near drainage from manure.

In volume I of the Proceedings [published after vol. II] reports are given of the discussions and lectures, together with the resolutions adopted by the Congress.

By a resolution of the Nomenclature Committee a textual amendment was made in art. B 54 of the International Rules, it being agreed that 'when on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based, and must be attributed to the author who first published it' [e.g. *Alternaria cheiranthi* (Fr.) Bolle is now the correct citation of *Macrosporium cheiranthi* Fr., notwithstanding the fact that Bolle mistakenly described and figured the species under that name: ibid., xiii, p. 595].

The Committee on description and nomenclature of plant viruses appointed by the Fifth International Botanical Congress (1930) was empowered to continue its considerations and establish an acceptable system of virus nomenclature. J. Johnson submitted a list of plant viruses with tentative designations and synonyms, the proposals contained in which received considerable support from virus workers at the Congress.

It was recommended that the term 'physiologic race' be substituted for 'physiologic form' as more appropriate.

The view was adopted that plant quarantine regulations present an international problem to which the attention of the League of Nations should be drawn [ibid., xv, p. 688].

Report of Proceedings, Second International Congress for Microbiology, London, 1936.—579 pp., 1 graph, 1 diag., Harrison & Sons, Ltd., London, 1937.

In this report it is stated that the resolutions of the Nomenclature Committee of the International Society for Microbiology regarding the status of the genus *Bacillus* and its type species *B. subtilis* [*R.A.M.*, xv, p. 80] were passed by the Second Congress, held in London in July and August, 1936. [In view of this decision, the use of the name *Bacillus* for bacterial species not producing endospores is clearly invalid, and consequently it cannot be retained by plant pathologists for non-sporing bacteria motile by means of peritrichiate flagella.]

It was resolved that 'generic homonyms are not permitted in the group Protista' and that 'it is advisable to avoid homonymy amongst Protista on the one hand, plants or animals (Metazoa) on the other'. It was also agreed that 'while specific substantive names derived from names of persons may be written with a capital initial letter, all other specific names are to be written with a small initial letter'.

Among the papers communicated to the Congress the following may be mentioned. S. F. Ashby (p. 44) recorded the survival in culture of two isolations of the sensitive fungus *Phytophthora hibernalis* [ibid., xvi, p. 312] received from California and South Africa in January, 1933. The optimum temperature for this fungus is 15° to 20° C. and the

maximum between 20° to 25°, but the isolations survived the hot, dry summer of that year, oospore germination being obtained in January, 1934.

J. Henderson Smith (p. 78) in opening a discussion on the general characteristics of viruses pointed out that some problems, such as those connected with the nature of viruses, are more easily studied in plants than in animals. Specificity of host range in viruses is exceptional in animals as well as plants. The same virus may produce different effects in different hosts, and similar symptoms are not necessarily due to the same virus. Closer contact between the animal and plant sides of virus research would benefit both.

T. Matsumoto (p. 91) [ibid., xv, p. 403] in serological studies on plant viruses found that the tobacco mosaic virus passes out from the young inoculated leaf usually in two days at 28° C., travelling to the top and root of the plant almost simultaneously, though usually reaching the top earlier. The virus is as concentrated in the xylem as in the cortex, though weakening with age in the former. Less virus is present in the flower buds, upper stems, and sepals than in the bud leaves, basal stems, and petals, while the stamens and pistils contain very little. With bacteriophage strains from *Bacterium solanacearum* the lytic agents stimulate the production of a specific neutralizing anti-body, but cannot produce precipitin. By means of the precipitin test the author was able to differentiate a number of viruses.

R. N. Salaman (p. 106) expressed the view that plant immunity from virus diseases [ibid., xv, p. 676] depends on the existence of non-virulent sub-varieties of the invading virus. For example, there is no evidence of multiple strains of potato virus Y, but a less virulent variety confers immunity against more virulent strains. Natural immunity, in which virus spread is inhibited by necrotic reaction at the point of entry, can sometimes be overcome by inducing rapid growth, foci developing in the fresh shoots becoming necrosed and localized. In naturally immune plants viruses, apparently, cannot lodge in the cells; the juices of such plants show no evidence of antibodies.

J. Ramsbottom (p. 146), in opening a discussion on mycoses in man, animals, and plants, commented on the bewildering, chaotic condition of the taxonomy of medical fungi, and emphasized the necessity of applying the usual mycological technique and recognized terminology for any progress to be made. He stated that many of the fungi recorded as causing medical mycoses are typical saprophytes, while it is possible that most are only facultative parasites.

E. J. Butler (p. 148) stated that the long-continued attempt to find a type medium on which to grow fungi so as to obtain a standardized morphological description for comparative use has failed, and in its place has grown up the conception of the normal high culture providing the best basis for correct classification. The use of this method has resulted in fuller expression of morphological characters and has been the means of considerably reducing the number of genera and species of the dermatophytes, has greatly simplified the confusion prevalent among these fungi, and confirmed Sabouraud's view of their close mutual relationship. The same principles apply to other fungi, e.g., by the use of natural substrata *Acladium castellanii* [ibid., xv, p. 502] can be shown

to be morphologically closely allied to *Sporotrichum schenkii* [ibid., xvi, p. 254], and that 'acladiosis' should be included in the sporotrichoses. The pathogenic fungi of warm-blooded animals require a cultural technique giving a normal high culture growth.

P. H. Gregory (p. 148) emphasized the value of *in situ* cultures in the classification of dermatophytes.

W. Brown (p. 149) in a paper on the 'Nature of resistance to fungus disease in plants' stated that correlations between resistance and the presence of substances toxic or inhibitory to the parasite are probably exceptions to the rule that the resistance of a plant does not depend on extracts obtainable from it. Resistance is commonly based on the ability of the living tissues to break down the offensive mechanism of the parasite. It was found that in a resistant host apparently containing no substances antagonistic to particular fungi or bacteria, when the living tissue was presented in a form non-susceptible to invasion, it was also unaffected by the cell wall-destroying enzyme. It was also possible to modify the living tissue so that it became susceptible to the parasite and the enzyme.

J. F. D. Shrewsbury (p. 151) found that the common thrush fungus, *Candida albicans* [ibid., xvi, p. 382], is lethal to rabbits inoculated intravenously in doses of not under 60,000,000 living fungus cells per c.c. of inoculum. It is incapable of progressive multiplication in, or invasion of, the body tissue, and all attempts at infection through the natural routes were unsuccessful. Sub-lethal doses cause progressive loss of weight; the fungus cells behave only as irritant foreign bodies in the tissues, producing a non-specific cellular reaction, composed of small, round cells with no giant cells, which are restricted to the immediate vicinity of the fungal embolus.

A. Panayotatou (p. 152) in an account of 'Mycoses of man in Alexandria' stated that in Egypt strains of *Monilia* with the biological and chemical reactions of *M. metalondinensis* [*C. albicans*: ibid., xi, p. 373] and *M.* [*C.*] *tropicalis* [ibid., xv, pp. 439, 502] were isolated in pure culture from cases of acute tonsillitis. A *Penicillium* was isolated from the diseased tongue of a child. A strain of *Monilia* resembling *Zeylanica castellanii* but with a white growth and a negative lead reaction was isolated from a case of respiratory mycosis and named *M. alexandrina*. The same fungus was isolated from mycotic urethritis. *C. tropicalis* was isolated from mycotic vaginitis and a *Cryptococcus* from a case of folliculitis.

Baens (L.) & Yenko (F. M.). **Effect of molds on some Philippine tanning liquors II.**—*Philipp. J. Sci.*, lxi, 4, pp. 417–426, 4 graphs, 1936. (Issued 1937.)

Further tabulated studies on the effects of *Aspergillus niger* and *Penicillium glaucum* and of mixtures of these on the tanning liquors extracted from betel nut (*Areca catechu*) kernels and the bark of *Acacia decurrens*, *Terminalia edulis*, and *Pithecolobium dulce* [*R.A.M.*, xvi, p. 266] showed that in general mould action decreased the tannin content of the extracts. A rise in the P_H value of the extracts resulted in a considerable decrease in tannin content. The lower the acid content of the extract the greater was the mould action. The betel nut and

A. decurrens extracts were susceptible to *Aspergillus niger* but resistant to *P. glaucum*, the reverse obtaining with *T. edulis*. Both moulds caused large loss of tannin in the *P. dulce* extract.

McKinney (H. H.). **Virus mutation and the gene concept.**—*J. Hered.*, xxviii, 2, pp. 51–57, 1 pl., 2 figs., 1937.

From his study of mutation in the virus of tobacco common mosaic [*R.A.M.*, xv, p. 321] the author suggests that the virus and its mutants show the essential elements of inheritance, since they regenerate true to measurable types, the mutants and sub-mutants retain characters of the primary virus, and the sub-mutants those of the strains from which they derive.

It is unnecessary to assume that the virus is a degenerated organism; it may be a stage in progressive development, and may possess a simple metabolism. The primary virus and its mutants are no doubt a series of related compounds functioning as genes. The characters of a given virus may correspond with the properties of a single compound and changes in any of these characters (mutants) may indicate changes in the compound.

Cook (M. T.). **Insect transmission of virus diseases of plants.**—*Sci. Mon., N.Y.*, xliv, 2, pp. 174–177, 1936.

A concise review is given of some of the more important contributions to the knowledge of the transmission of plant viruses by insects, of which over 135 species are now stated to be recognized as vectors. The first allusion to the subject traced is from England, where Smee reported in 1846 that *Aphis vastator* was very abundant on potatoes affected by 'curl' disease, while Woods in 1897 drew attention to the presence of aphids [*A. gossypii*] on material affected by the Bermuda lily disease [yellow flat or rosette] now known to be due to a virus [*R.A.M.*, xiii, p. 165]. Rice dwarf in Japan [ibid., xvi, p. 123] and curly top of sugar beets in the United States [see above, p. 433] appear to be the first diseases for which definite records of insect transmission are available. The more recent references to these and other disorders cited have been noticed from time to time in this *Review*.

Dominik (T.). **Badania nad mykorhizą niektórych obcych drzew iglastych aklimatyzowanych w Polsce.** [Observations on the mycorrhiza of certain foreign coniferous trees acclimatized in Poland.]—*Roczn. Nauk rol.*, xli, 2, pp. 44–46; 1937. [French summary.]

Morphological and anatomical studies showed that the roots of 11 species of imported conifers, which have become acclimatized in Poland, have found in their new surroundings suitable soil fungi, chiefly Basidiomycetes, with which to develop an adequate mycorrhizal system. In some localities, however, the roots examined were devoid of mycorrhiza, but this also applies to strictly native coniferous species, and is attributed to the influence of edaphic and other environmental conditions. Observations indicated that the trees supplied with mycorrhiza thrive better, and are economically more valuable, than those deprived of these formations.

GARBOWSKI (L.). **Wpływ gleby na rozwój mozaiki smugowatej w doświadczeniu z odmianą Ziemniaków Industria Modrowa.** [Influence of soil on the development of streak mosaic in tests with the Potato variety Modrow's Industrie.]—*Roczn. Nauk rol.*, xli, 2, pp. 387–391, 1937. [English summary.]

Details are given of comparative tests in 1935, in which virus-diseased potatoes of the Modrow's Industrie variety of the same origin were grown on a fertile and well-manured soil and in a poor, sandy soil dressed with only 8 kg. potassium nitrate, 12 kg. of a 22 per cent. potassium salt, and 10 kg. superphosphate per 5 ares. The resulting crop was heavily infected with virus diseases, especially with a condition termed by the author 'streak mosaic', characterized by a deformation of the leaf blades, streaks in the vicinity of the veins, brittleness of the stems, and premature yellowing and death of the lower leaves. About 2½ times as many plants on the sandy soil were affected with the disease as on the fertile plots, but the percentage reduction in yield of individual plants due to the disease was approximately the same on the two soils. It is pointed out that topographically and ecologically the environmental conditions were very similar on the two descriptions of experimental plots.

RUHLAND (W.) & MICHAEL (G.). **Zur Physiologie des sog. Kartoffelabbaues.** [On the physiology of the so-called Potato degeneration.] —*Ber. Verh. Akad. Wiss. Leipzig*, lxxxviii, 1, pp. 3–10, 1 graph, 1936.

Such physiological disturbances as are liable to occur in the carbon assimilation, respiration, carbohydrate translocation, and diastatic functions of potato tubers are not regarded by the writers as specific indicators of 'degeneration' [*R.A.M.*, xvi, p. 401]. A more uniform and general cause must underlie the heterogeneous and disconnected complex of individual manifestations, and this was shown by studies on the 'degenerating' Erdgold, Wekaragis, Odenwälder Blaue, and Modrow's Industrie varieties to reside in a weakened or pathological condition of the protoplasm, expressed by enhanced susceptibility (abnormal plasmolysis and giving-off of anthocyanin) to the action of unbalanced sodium chloride solutions and to certain narcotics, e.g., 3 c.c. ether per l. air space, the latter inducing post-mortem discolorations (black in the parent tubers, grey to brownish-yellow in the progeny).

Ramshorn's electrometric method (*Planta*, xxii, 1934), involving the measurement of the polar potential difference between the apical and basal tuber pole on living tubers [cf. *R.A.M.*, xvi, p. 336], was used to determine the progressive degrees of degeneration in the progeny of affected tubers. For practical purposes, however, the writers recommend the ether and salt methods, the latter merely consisting in the strewing of large quantities of sodium chloride over the cut tuber surfaces, to which 'degenerate' material reacts by a discoloration of the basal region.

In a brief concluding discussion, the writers state that their observations do not conflict with the virus theory of degeneration, but they are not absolutely convinced of its validity.

Schultz (E. S.), Clark (C. F.), Raleigh (W. P.), Stevenson (F. J.), Bonde (R.), & Beaumont (J. H.). **Recent developments in Potato breeding for resistance to virus diseases.**—*Phytopathology*, xxvii, 2, pp. 190–197, 1937.

Further experiments at Presque Isle, Maine, in connexion with the development of potatoes resistant to virus diseases [*R.A.M.*, xiv, p. 464] revealed wide variations in the reaction of varieties and seedlings to these disorders. Some seldom or never contract a given virus by leaf-rubbing in the field but do so in graft tests, while in other cases the disease is readily transmitted by both methods. In the latent mosaic trials several hundred plants of S 41956 failed to contract the disease either by leaf-rubbing or grafting, whereas Katahdin was highly resistant in the field but became infected by grafting. The latter has been completely resistant to mild mosaic [see below, p. 489] in field tests for a number of years, but it is not homozygous for this character as shown by the susceptibility of 9 per cent. of the seedlings in a selfed progeny. The offspring of the No Blight × Katahdin cross gave a ratio of apparently resistant to susceptible of 86 : 14. No definite evidence of resistance to veinbanding mosaic [ibid., xvi, p. 116] was forthcoming, but the severity of the symptoms varied greatly—from intensive streaking and rugosity to mild wrinkling—in the offspring of different crosses. Similar variations were observed in tuber-grafting tests with spindle tuber [see preceding abstract] and leaf roll, the field exposure trials in both of which diseases yielded indeterminate results, though leaving grounds for hope that at any rate tolerance, if not resistance, to these disturbances may be developed.

Mader (E. O.) & Mader (Mary T.). **The composition of tubers of sprayed and unsprayed Potato plants in relation to cooking quality.**—*Amer. Potato J.*, xiv, 2, pp. 56–59, 1937.

The tubers of potato plants sprayed with Bordeaux mixture [chiefly against *Phytophthora infestans*] were found to darken much less on cooking than those from untreated plants, a fact that may be correlated with the lower tyrosine and iron contents of the former (0·0483 and 0·422 per cent., respectively) compared with the latter (0·0715 and 0·667) [cf. *R.A.M.*, xii, p. 531].

Tucker (J.). **The value of seed Potato certification to the Potato industry.**—*Amer. Potato J.*, xiv, 2, pp. 39–45, 1937.

Some figures are quoted to illustrate the value of seed potato certification to the Canadian potato industry [*R.A.M.*, xii, p. 188; xiv, p. 494]. In 1935 the total acreage certified was 83,537 and the total production 16,551,608 bushels, the corresponding figures for 1920 being 10,674 and 1,294,671, respectively. During the five-year period 1932 to 1936, the average percentages of blackleg [*Erwinia phytophthora*], leaf roll, and mosaic in the 41,496 fields inspected were 0·16, 0·21, and 0·9, respectively, compared with 0·67, 0·34, and 2·39 in 20,537 fields in 1922 to 1926, and with 0·22, 0·13, and 0·76 in 47,855 fields in 1927 to 1931. During the five-year period 1921 to 1925, 32·05 per cent. of the total number of fields examined were rejected, mainly on account of virus

diseases, whereas in 1931 to 1935 the percentage was reduced to 24·19 in spite of higher standards and more than double the acreage. By means of the tuber-unit selection method the yield obtained per acre in commercial fields has been increased from 369·1 bush. in 1928 to 417 in 1934.

GREEVES (T. N.). **The control of blight (Phytophthora infestans) in seed Potatoes by tuber disinfection.**—*Ann. appl. Biol.*, xxiv, 1, pp. 26–32, 1 pl., 1937.

Storage rot in seed potatoes due to late blight (*Phytophthora infestans*) is stated to be frequently severe in the tubers lifted during periods when the fungus is sporulating on the tops. The results of experiments carried out in Belfast showed that the rot may be prevented by disinfecting the tubers immediately after digging, while disinfection two or three days later gave little or no control of the rot. The two methods of disinfection tested, namely, steeping the tubers for 90 minutes in 0·1 per cent. mercuric chloride solution or dipping them for 30 seconds to 1 minute in a 1 per cent. solution of a proprietary organic mercury compound, gave equally satisfactory control, and had no injurious effect on the subsequent sprouting of the tubers. The mercuric chloride steep caused, however, a slight pitting in the form of small brown depressions on the surface of the tubers. There was, further, an indication that the practice of 'greening' the seed tubers by leaving them exposed out of doors in boxes is not likely to give any control of late blight, when digging is followed by wet weather.

GOSS (R. W.). **The Fusarium wilt of Potatoes.**—*Proc. 22nd ann. Meet. Ohio Veg. Grs' Ass.*, pp. 60–66, 1937.

In Nebraska, *Fusarium* wilt of potatoes [*R.A.M.*, xvi, p. 56] may be caused by *F. oxysporum* or *F. solani* var. *eumartii* or by both together, and there is no reliable method of distinguishing the two diseases by tuber symptoms though stem-end rot is not produced by inoculation with the former fungus. For all practical purposes the grower may regard *Fusarium* wilt as one disease.

Three years' tests with infected Bliss Triumph potatoes showed average stands of 66 and 92 per cent. for infected and healthy seed, respectively, the percentages of infection in the field and in the harvested potatoes being 14 and 19 per cent. for infected seed and 3 and 7 per cent. for healthy seed. When the same lot of healthy, treated seed potatoes was sown on 100 different farms 94 per cent. of the fields produced infected tubers, the average amount of infection for all the fields being 4·5 per cent. One field, with 47 per cent. infection, had never before been planted to potatoes, and another, with 30 per cent., was virgin soil. This is regarded as evidence that both fungi may be present in virgin soils, though many soils appear to be free from them.

Experience has shown that heavily infested soil is more dangerous than infected seed; when infection takes place from the soil through the cut surface of the seed piece, the stem is quickly affected and often becomes completely rotted early in the season, the tops rapidly wilting.

Control offers a difficult problem, but incidence can be reduced by planting only healthy seed pieces or small whole seed and avoiding soils

that produced a heavily infected crop in the previous year. The average date of planting in Nebraska is 10 days to 2 weeks later than it was ten years ago, and this delay reduces not only wilt, but also scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium solani*], and early blight [*Alternaria solani*].

Goss (R. W.). **The effect of crop rotations on some soil-borne diseases of the Potato.**—*Proc. 22nd ann. Meet. Ohio Veg. Grs' Ass.*, pp. 77–84, 1937.

Further results obtained on the experiment in progress in western Nebraska since 1912 to determine the effect of irrigated crop rotations on potato diseases [*R.A.M.*, xv, p. 603] showed that from 1932 to 1936 inclusive the highest infection by *Rhizoctonia* [*Corticium solani*], as estimated by the weight of tubers with sclerotia, was 70 per cent., and occurred in the plot planted continuously to potatoes for 25 years. There was a large amount of infection in the two-year rotations with beets (26 per cent.), oats (31 per cent.), or maize (25 per cent.), but a marked decrease occurred in the four-year rotations; no further reduction resulted when the rotation was increased to six years.

The results with *Fusarium* wilt [*F. oxysporum* or *F. solani* var. *eumartii*: see preceding and next abstracts] were somewhat less definite, but the highest infection occurred in the two-year rotation with maize, where it was slightly greater (7·8 per cent.) than in the continuous potato plot (6·5 per cent.). There was a marked reduction in infection in the four- and six-year rotations with lucerne preceding potatoes, and the best results were in the long rotations in this series.

Rotations under four years resulted in considerably more scab [*Actinomyces scabies*: ibid., xvi, p. 273] than longer ones, but continuous cropping of potatoes gave relatively little scab, possibly because the potatoes ceased growth about one month earlier than those in the better rotations and were usually very small. The increased yields and larger tubers resulting from manuring, however, showed it to be economically profitable, even though it greatly increased the percentage of scab.

Goss (R. W.). **A review of the disease problems confronting the Nebraska growers of certified seed Potatoes.**—Reprinted from *Rep. Neb. Potato Impr. Ass., 1936*, 14 pp., [1937].

From 1931 to 1935, the chief virus disease in Nebraska potato fields entered for certification was spindle tuber [*R.A.M.*, xv, p. 821], owing undoubtedly to the number of insect vectors of this disease and their prevalence. At the first inspection each year, during the early stages of growth, incidence ranged from 31·7 to 50 per cent. infected fields, with 0·2 to 0·5 per cent. average infection per field. The next most prevalent virus disease was mild mosaic, but the percentage infection per field was not large. Rugose mosaic, unmottled curly dwarf, and curly dwarf [ibid., xvi, p. 270] were present to a slight extent in a few fields. Blackleg (*Erwinia carotovora*) occurred in the low-lying parts of some fields, but is not a serious problem.

Fusarium wilt (*F. oxysporum* and *F. solani* var. *eumartii*) [see preceding abstracts] usually occurred in 80 to 95 per cent. of the fields,

infection averaging about 3 per cent. of the harvested crop, even after severe roguing and the rejection of badly diseased fields. Tuber infection was lowest in 1934, when drought prevailed, incidence generally being highest in years favourable to production. *Alternaria solani* was not of great importance as a rule but may cause considerable loss in storage, *Rhizoctonia* [*Corticium*] *solani* caused much sprout injury in cool, wet springs, and *Actinomyces scabies* [see preceding abstract] was apparently present in all soils, but was less important in dry than in damp years.

A condition known locally as 'hay wire' and present in Nebraska potato fields for at least fifteen years has recently become increasingly prevalent, 47·4 per cent. of the fields being affected in 1935. The hills emerge late or not at all, and the dormant seed pieces may produce sprout tubers. The affected plants are much dwarfed, with a rosette appearance. The leaflets are generally rugose, erect, stiff, rolled, pointed, yellowish, and often purple at the tips and margins. The petioles and stems may show red or purple swellings at the nodes, and sometimes aerial tubers develop in the leaf axils. Tubers, when formed, are few, and set close to the stem. In some cases, the underground stem may be rotted with a brown flecking in the pith of the stems at the nodes. Plants in the greenhouse also showed a blight of the terminal leaflet extending a short distance down the stem, accompanied by a hollow stem split at the apex.

No pathogenic organism was found in affected tissues. Over 100 tuber plug inoculations gave negative results, but when inarch grafts were made from affected to healthy plants the latter developed hay-wire symptoms. The disease would appear to be of virus origin, but the very slow spread indicates that probably a comparatively uncommon insect vector is involved.

Tullis (E. C.). **Fungi isolated from discolored Rice kernels.**—*Tech. Bull. U.S. Dep. Agric.* 540, 11 pp., 4 figs., 1936.

Considerable importance is attached to the fungal discoloration of rice kernels, which is becoming increasingly prevalent in Louisiana, Texas, and Arkansas, especially in early varieties, such as Fortuna, Early Prolific, and Lady Wright. The elimination of the defect gives rise to excessive breakage in milling operations, yet the removal of the blemishes is essential to the good appearance and value of the finished product. Various types of discoloration have been observed, by far the most frequent being the ebony-black to chocolate-brownish stains produced by *Curvularia lunata* [*R.A.M.*, xvi, p. 232] and the light brownish tinge (macroscopically indistinguishable from the foregoing) due to *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xvi, p. 405]. Kernels attacked by *C. lunata* may bear small, dark sclerotia, similar organs being also typical of *Trichoconis caudata* (Ap. & Str.) Clem., the agent of a faint pink to reddish-brown discoloration of the caryopsis. *Monascus purpureus* [ibid., viii, p. 785] produces a red stain or spotting of the kernels and may also be isolated from the glumes. Other fungi isolated on maize meal agar from kernels of 18 varieties after sterilization by hot water (five minutes at 54° C.) or a two-minute dip in 1 in 1,000 mercuric chloride included (in order of frequency) *Phoma* spp., *Alternaria* spp., *Cladosporium herbarum*, *Nigrospora oryzae* [ibid., xv,

pp. 746, 779], *Curvularia maculans*, *Epicoccum neglectum* [ibid., xiii, p. 538], and *Helicoceras oryzae*. The parasites gain ingress through the glumes and attack the kernel before maturity, while the saprophytes may develop at a later stage from spores lodged within the glumes at flowering time, or they may penetrate the glumes of the harvested rice in the shock.

Nelson (R.). **Verticillium wilt of Peppermint.**—Abs. in *Phytopathology*, xxvii, 2, p. 137, 1937.

The initial symptoms of a serious peppermint [*Mentha piperita*] wilt, first observed in Michigan in 1924 but thought to be responsible for the earlier abandonment of large acreages of the crop, include dwarfing and the unilateral development and bronzing of terminal leaves. In July and August the affected plants show typical *Verticillium* symptoms and rapidly succumb, necessitating the premature cutting of diseased fields and involving low yields of oil. English and American peppermints are very susceptible, but some of the spearmints [*M. spicata*] are resistant. The disease is caused by a species of *Verticillium* morphologically resembling *V. dahliae*. Soil moisture exerts a marked influence on the development of the disorder, the destructiveness of which has been enhanced during the last six years by excessive drainage and droughts. Satisfactory commercial control has been effected by the maintenance of a high water table.

Blumer (S.). **Pilze. Neue oder bemerkenswerte Vorkommnisse und neu unterschiedene schweizerische Arten.** [Fungi. New or noteworthy finds and newly differentiated Swiss species.]—*Ber. schweiz. bot. Ges.*, xlv, pp. 297–311, 1936.

The following are among the records of interest not already noticed from other sources, in this annotated list of new or otherwise noteworthy Swiss fungi. *Phyllactinia suffulta* [*P. corylea*: *R.A.M.*, xiv, p. 680] was collected in October, 1935, on a cultivated pear at Morges [Vaud]. *Acer platanoides* and roses at Berne suffer severe damage from *Verticillium albo-atrum* [ibid., v, p. 469; xii, p. 338; xvi, p. 286].

Jørstad (I.). **Notes on some heteroecious rust fungi.**—*Nyt Mag. Naturv.*, lxxvii, pp. 105–119, 1 fig., 2 maps, 1937. [Norwegian summary.]

Chrysomyxa woronini was detected in the spring of 1936 on a spruce near Oslo. The alternate host, *Ledum palustre*, is very rare in south Norway, the nearest locality in which it occurs being 30 km. away, while a distance of some 140 km. separates the infected site near Oslo from a region of continuous distribution of *L. palustre* in south Sweden. The rust produces witches' brooms on *L. palustre* and malformations on the current year's spruce shoots. Liro regards *C. woronini* and *C. ledi* [*R.A.M.*, xii, p. 799] as identical, but the author has shown in his study on Kamchatka Uredinales [ibid., xiii, p. 597] that this view cannot be maintained.

The aecidial stages of the rust 'races' comprised in the collective species *Melampsora epitea* [ibid., xv, p. 175] attacking *Salix* in the mountains are found on species of *Saxifraga*, *Viola*, and probably

Epilobium. The 'race' *M. reticulatae* Blytt, for instance, alternates between *S. aizoides* and *Salix reticulata* [ibid., xi, p. 412], and probably also *S. phylicifolia* and *S. hastata*. Those alternating with *Saxifraga* are united as *M. arctica* and occur at altitudes up to 1,600 m. The aecidial host of *M. alpina* [loc. cit.] on *Salix herbacea* and *S. polaris* is *Saxifraga oppositifolia*. The caeomata occurring on *E. hornemanni* and other *E.* spp. are probably connected with a race of *M. epitea* on *Salix phylicifolia*. *M. lapponum*, the distribution of which is primarily subalpine, passes its aecidial stage on *V. palustris* and *V. epipsila* [*V. suecica*] and rarely forms teleutospores on *S. lapponum*.

Conners (I. L.). **Additions to the fungus flora of Anticosti Island and Gaspé Peninsula.**—*Canad. Field Nat.*, li, 1, pp. 6–7, 1937.

The following are among the fungi collected by J. Adams on Anticosti Island and the Gaspé Peninsula, Quebec, during 1935 [cf. *R.A.M.*, xv, p. 259]: *Claviceps purpurea* on *Oryzopis asperifolia*, *Gymnosporangium clavipes* [ibid., xvi, p. 190] on *Amelanchier canadensis*, *G. juniperi* [ibid., xv, p. 609] on *Sorbus* [*Pyrus*] *americana*, and *Cylindrosporium hiemalis* causing a well-defined shot hole disease of *Prunus pennsylvanica*.

Arthur (J. C.) & Cummins (J. B.). **Philippine rusts in the Clemens collection 1923–1926, II.**—*Philipp. J. Sci.*, lxi, 4, pp. 463–488, 4 pl., 1936. (Issued 1937.).

This final instalment of the authors' annotated list of rusts in the Philippine Islands [*R.A.M.*, xv, p. 827] includes 113 species on hosts belonging to 38 families, of which the following may be mentioned: *Crossopsora fici* n.sp. on *Ficus variegatus*, *Pucciniosira clemensiae* n.sp. (known in the teleutospore stage only) on *Berberis barandana*, *Puccinia periodica* on *Derris polyantha*, and *Uredo derridicola* n.sp. on *Derris* sp. Latin diagnoses are supplied for all new species and an index to the rusts enumerated in this series of papers is appended.

Tai (F. L.). **Note on Chinese fungi. VII.**—*Bull. Chin. bot. Soc.*, ii, 2, pp. 45–66, 5 pl., 1936.

Continuing his enumeration of Chinese fungi [*R.A.M.*, xv, p. 746; xvi, p. 1], the writer presents an annotated list of 55 species of *Cercospora*, including *C. althaeina* on *Althaea rosea* [ibid., xiv, pp. 471, 755]; *C. apii* on celery [ibid., xv, p. 552]; *C. brachypus* on *Parthenocissus tricuspidata*; *C. canescens* [ibid., xvi, p. 344] on cowpea, *Phaseolus aureus*, *P. vulgaris*, *P. mungo* and its var. *radiata*, and *Dolichos lablab*; *C. cannabis* on hemp [ibid., xii, p. 395]; *C. chrysanthemi* on *Chrysanthemum coronarium*; *C. circumscissa* [ibid., ii, p. 535; iv, p. 682; xi, p. 789 and next abstract] on peach; *C. citrullina* on vegetable marrow [ibid., x, p. 771]; *C. cruenta* (as synonyms of which, on the authority of C. Chupp's examination, the author regards *C. phaseolina*, *C. phaseolorum*, *C. vignae* E. & E. [ibid., vi, p. 148], *C. dolichi* [ibid., xiii, pp. 11, 674], *C. vignae* Rac. [ibid., xiii, p. 805], *C. lussoniensis*, *C. raciborskii*, *C. vignae-sinensis*, and *C. neovignae* [loc. cit.]) on cowpea [ibid., xiv, pp. 195, 280] and *P. mungo*; *C. daizu* on soy-bean [ibid., xiii, p. 490]; *C. destructiva* on *Euonymus japonicus*; *C. hydrangeae* on *Hydrangea*

paniculata; *C. kaki* on persimmon; *C. paeoniae* on *Paeonia albiflora* [ibid., xv, p. 99]; *C. personata* (*C. arachidis*) on groundnut [ibid., xv, p. 278; xvi, p. 232]; *C. pueraricola* on *Pueraria thunbergia* [*P. hirsuta*]; *C. sorghi* on sorghum [ibid., xiv, p. 286]; *C. sphaeriaeformis* Cke (*C. ulmi* Syd.) on elm (*Ulmus pumila*); *C. subsessilis* on *Melia azedarach*; *C. vignicola* on cowpea; and *C. vitis* (*C. viticola*) on vine [ibid., xii, p. 395].

KOVACHEVSKY [KOVAČEVSKI] (I. C.). Нови паразитни гъбп за България. IV Приносъ. [Parasitic fungi new for Bulgaria. Fourth contribution.]—*Trav. Soc. bulg. Sci. nat.*, xvii, pp. 13–24, 1936. [English summary. Received April, 1937.]

An annotated list is given of 19 plant-parasitic bacteria and fungi, all recorded for the first time from Bulgaria during the last few years, including the following: *Phytomonas* (*Bacterium*) *cumini* on cumin (*Cuminum cyminum*) [*R.A.M.*, xv, p. 681]; *Bact. vesicatorium* [ibid., xvi, p. 419] and *Aplanobacter michiganense* [loc. cit.] on tomatoes; *Mycosphaerella rabiei* on chick pea (*Cicer arietinum*) [ibid., xv, p. 700]; *Entyloma fuscum* on cultivated poppy (*Papaver somniferum*) [ibid., xv, p. 23]; *Phoma lingam* [ibid., xv, p. 335; xvi, p. 438] on cabbage; *Septoria curvata* causing a leaf spot of *Robinia pseud-acacia*; *S. melissae* on *Melissa officinalis* [ibid., viii, p. 790]; *Gloeodes pomigena* and *Leptothyrium pomi* on apple fruits [ibid., xv, p. 745]; *Cryptosporium minimum* on the rose [ibid., xvi, p. 229]; *Fusicladium depressum* var. *petroselini* on parsley [ibid., i, p. 354]; *Cercospora circumscissa* [see preceding abstract] on almond nursery seedlings; *C. roesleri* on the vine [ibid., xv, p. 200]; *Isariopsis griseola* on French beans (*Phaseolus vulgaris*) [ibid., xiv, p. 734]; and *Macrophomina phaseoli* on French beans, *Vicia sativa*, sunflower (*Helianthus annuus*), and groundnut; by its sclerotia the last-named fungus belongs to Haigh's group C [ibid., ix, p. 686].

RAILLO (Mme A. I.). Систематика и методика определения видов рода **Fusarium.** [Taxonomy of the genus *Fusarium* and a method for the determination of the species belonging to it.]—*Acta Inst. Bot. Acad. Sci. U.R.S.S.*, Sér. II (*Pl. Cryptogamae*), *1936*, 3, pp. 803–857, 6 pl., 5 figs., 1936. [English summary.]

In this paper the author gives a detailed description of the standardized method suggested by her for the systematic study of the fungi belonging to the genus *Fusarium* [*R.A.M.*, xv, p. 684], as well as instructions for the preparation of the standard culture media (potato agar and acidified potato agar) which she considers as best adapted to maintain a typical development of the organisms. She further recommends that the measurement of macroconidia be made at regular intervals of 15 days from the inception of the cultures to ensure that none is over 15 days old, since her observations showed that these organs are most characteristic of the given species on the 15th day of growth.

In the second part dichotomous keys are given for the determination of the sections and species of the genus, based on the work of Wollenweber, though the recent joint monograph of this author and Reinking [ibid., xiv, p. 708] was received by the writer too late to be taken into consideration in this paper.

ANDRUS (C. F.) & HARTER (L. L.). **Organization of the unwalled ascus in two species of Ceratostomella.**—*J. agric. Res.*, liv, 1, pp. 19–46, 7 figs., 1937.

This is a detailed and fully illustrated account of the authors' studies of the origin and development of the ascus in *Ceratostomella fimbriata* [*R.A.M.*, xv, p. 734] from sweet potato and *C. moniliformis* isolated from timber (on which it does not appear to be an active agent of decay or blue stain), as representatives of Ascomycetes with asci of the so-called deliquescent type. Among other cytological details, considerable stress is laid on the fact that in the two species investigated the asci possess no external wall at any stage of their development, the vesiculate condition in *C. moniliformis* being made evident by the presence of a cleavage space surrounding the spore-producing region, while in *C. fimbriata* a definite endogenous wall, of the nature of a plasma membrane, equivalent to the surface layer of cytoplasm such as occurs on any essentially naked or plasmodial mass, frequently encloses the vesicle. Data are presented which tend to show that this membrane is continuous with, or derived from, the membrane of the fusion nucleus. Deliquescence in these species, therefore, involves a disorganization of the peripheral layer of cytoplasm but does not appear to involve any process of wall dissolution.

GWYNNE-VAUGHAN (HELEN C. I.) & BROADHEAD (Q. E.). **Contributions to the study of Ceratostomella fimbriata.**—*Ann. Bot., Lond.*, l, 200, pp. 747–758, 2 pl., 15 figs., 1936.

As a result of their cytological studies on a culture of *Ceratostomella fimbriata* [see preceding abstract], which was sent to them by Andrus, the authors state, in describing the origin and development of the perithecium, that the multinucleate cells, the cells of the ascogenous hyphae, and the asci all possess the usual delicate cell walls, staining convincingly with erythrosin; no naked cells were seen by them, but sometimes a large vacuole in the cytoplasm of the ascus produces the illusion that the ascus nuclei are enclosed within it. The ascospores are of the form usually described as bowler hat-shaped.

TUBBS (F. R.). **On the growth and carbohydrate supply of the Tea plant after pruning.**—*J. Pomol.*, xiv, 4, pp. 317–346, 1 pl., 2 graphs, 1937.

In this physiological study of the reaction of the tea plant to three types of pruning, viz., 'clean' (pruned bush left almost leafless), 'lung' (some branches not pruned until a few days before 'tipping'), and 'cut across' (only diseased branches removed below the pruning-level) at elevations of 4,600, 1,500, and 200 ft. in Ceylon the following results are recorded in relation to die-back or *Diplodia* disease, ascribed by Petch to *Botryodiplodia theobromae* [*R.A.M.*, viii, p. 677; xv, p. 747]. It was found that at 200 ft. above sea-level, the mean number of dead bushes per plot after tipping in 1932 was 1·3, 11·2, and 4·5 for the three methods, respectively. The amount of die-back present varied from very little to complete death, the weights of the dead material for the three plots being, respectively, 21·7, 57·7, and 37·8 lb. One month after pruning, the average number of leaves per bush for each plot was,

respectively, 226·2, 9·5, and 61·3. The evidence indicated that die-back and the death of whole bushes after pruning are due to similar causes, and supported Gadd's view [ibid., viii, p. 69] that the disease is of physiological origin.

The author points out that tea shoots probably produce only half the carbohydrates necessary for their growth and that if die-back is associated with carbohydrate deficiency the production and removal of flush shortly before pruning should increase the disease. When 30 bushes were pruned after weekly yield records had been made for eight months, and the die-back per bush weighed, the results indicated that increased production of shoots in the month preceding pruning increased the amount of die-back.

In another test, early pruning by the 'clean' method gave most die-back, but the number of branches (3 or 6) left unpruned had no effect; with late pruning the three methods gave no difference.

The effects of 'lung' as compared with 'clean' pruning varied considerably at the three elevations, and as die-back occurred only at 200 ft. a survey was made of the carbohydrate reserves present in the roots at the different elevations. This showed that the percentage of total carbohydrates increased with increased elevation, the linear regression $y = 11{\cdot}17 + 0{\cdot}20\,x$ (y = percentage of carbohydrate, x = height in feet above sea-level) accounting for 77 per cent. of the variance in carbohydrate content. If die-back incidence is governed by the carbohydrate supply available after pruning, then this relationship explains the occurrence of die-back at low elevations only. Young seedlings also showed less starch at low than high altitudes.

TUBBS (F. R.). **Investigations on the planting, pruning, and plucking of the Tea bush.**—*Bull. Tea Res. Inst. Ceylon*, 15, 59 pp., [? 1937].

In chapter VI of this bulletin the writer discusses the relationship between pruning and the die-back of tea bushes ascribed by Petch to *Botryodiplodia theobromae* [see preceding abstract], and concludes that at elevations above 3,000 ft. sufficient carbohydrate reserves are present in the bushes to permit satisfactory recovery after pruning, but that at lower altitudes a certain amount of foliage must be left on the plants.

BALD (J. G.). **The use of numbers of infections for comparing the concentration of plant virus suspensions. I. Dilution experiments with purified suspensions.**—*Ann. appl. Biol.*, xxiv, 1, pp. 33–55, 4 graphs, 1937.

This is the first of a series of papers dealing with the principles involved in the estimation of the concentration of plant virus suspensions used in experimental inoculation work, and with the investigation in as much detail as possible of the various techniques adopted by various workers, a brief review of which is given. In a discussion of certain of the conditions on which the equation formulated by Youden, Beale, and Guthrie [*R.A.M.*, xv, p. 781] depends, the author shows that the exponent $-ax$ in it may be conveniently replaced by the function $-m$ which represents the ratio of virus units entering and causing infection to the total number of entry points, leaves, or whole plants, according to which of these latter units is used as a standard for judging infections.

The new equation then takes the form $y = N(1-e^{-m})$, in which the other symbols retain their former signification. The symbol m represents a mean value, and should be directly proportional to the concentration of the virus in the inoculum, provided there is no change of the virus unit with a change of concentration; it is by definition the product of two components, namely, p representing the probability of a single virus particle entering to cause infection, which is very small, and n representing the number of possibly infective particles applied, which is large. For the particular case of dilution experiments, the function m may then be expanded to pn_1x, in which n_1 is the value of n for an undiluted sample of inoculum, and x is a fractional value representing the concentration of the undiluted sample in the diluted inoculum. If the equation is based on correct premisses, then lack of agreement between the values obtained in dilution experiments and those calculated from the equation can only be due to variations in the values of N, p, and n_1 through ineffective control of the experimental environment, and ultimate agreement may be attained by a continuous improvement in the experimental methods.

The experiments described in this paper were made in the attempt to refine the technique until agreement was attained, since preliminary work had failed to show agreement between the experimental and calculated values. Seven successive dilutions of carefully purified samples of the viruses of the tobacco mosaic group, namely, tomato streak, yellow tobacco (aucuba) mosaic, and ordinary tobacco mosaic, and of potato virus X were inoculated into *Nicotiana glutinosa*, the inocula of the last-named virus being also tested on White Burley tobacco. The data obtained from the experiments, local lesions being reckoned as infection units, showed a fair degree of agreement with the values calculated from the equations fitted to them, as also did those obtained in the tests in which y was taken as the number of leaves infected. Two types of irregularities (distortions), however, were noticed in the dilution series, suggesting that they may have been mainly due to an effect of the impurities in the inoculum on the values of one or more of the terms N, p, and n_1; the real causes of these distortions cannot be definitely established without supplementary evidence. There were also indications that it is apparently unwise to assume that constant values of N will be obtained in lesion-dilution experiments except under the most carefully controlled conditions, and that the values for N and the other terms of the equation will necessarily be independent. In some of the cases discussed there was a suggestion at least that N may be independent of pn_1.

Government of India. Department of Education, Health and Lands. Notification. Agriculture.—4 pp., 1936.

By notification No. F.-320/35-A, dated 20 July 1936, superseding No. 580-240 [*R.A.M.*, ii, p. 239], the restrictions on the import of plants into India are modified as follows: No plant shall be imported by air. No citrus plants or cuttings may be imported unless accompanied by a certificate stating that they are free from mal secco (*Deuterophoma tracheiphila*) or that the disease is not present in the country of origin.